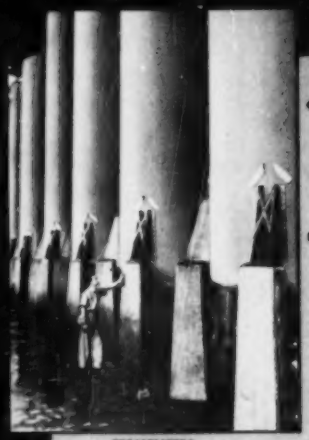
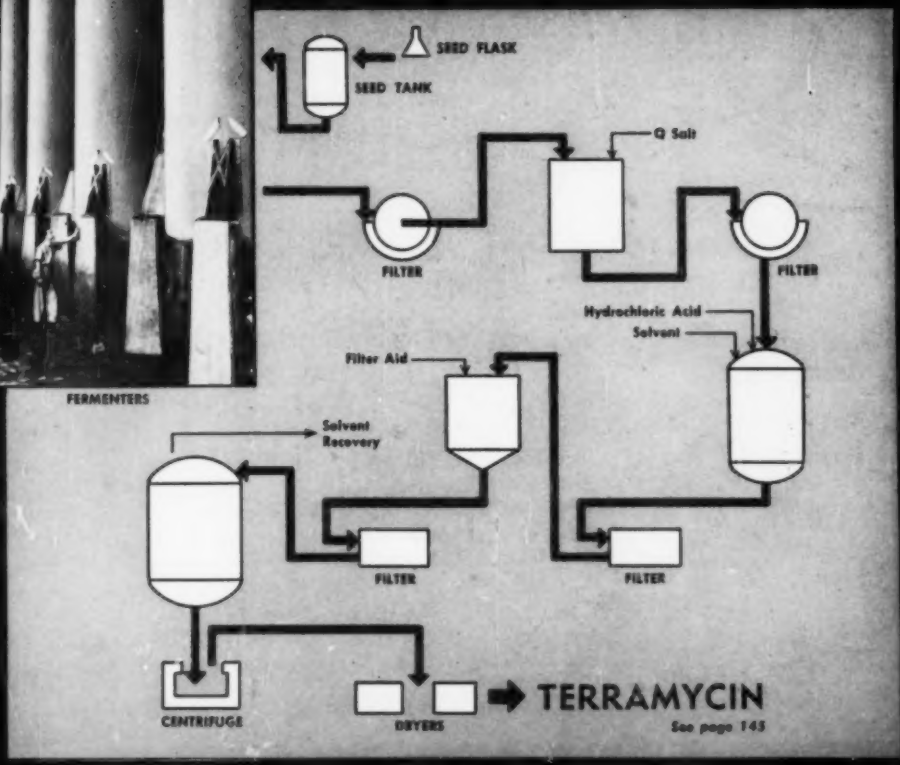
JANUARY
1952

Chemical Engineering



FERMENTERS



See page 143

A McGRAW-HILL PUBLICATION

FIFTY CENTS

Remember—
the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

It's a neat job...and it's stronger

Write Dept. H-1 for free booklet, "Allowable Working Pressures"

● Welded piping systems are streamlined. They save space, are easier to insulate and are permanently leakproof.

For a complicated connection like this, use of the TUBE-TURN Welding Cross also means extra strength. This welding cross is made from the same seamless tubing and by the same process as TUBE-TURN Welding Tees. Bursting pressures obtained in tests of representative tees and crosses have averaged more than 25% higher than required by standard codes. This gives you extra quality at no extra cost.

Welding your piping with TUBE-TURN Welding Fittings means a neater design and stronger construction. Get in touch with your nearby TUBE TURNS' Distributor. There's one in every principal city.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles

TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO... A wholly owned subsidiary of TUBE TURNS, INC.

JANUARY
1952

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

PUBLISHER ..... Wallace F. Traendly
EDITOR ..... John R. Callaham
MANAGING EDITOR ..... Lester B. Pope
SENIOR ASSOCIATE EDITOR ... T. R. Olive
ASSOCIATE EDITOR ..... Cecil H. Chilton
ASSISTANT EDITOR ... Morgan M. Hoover
EDITORIAL DIRECTOR ..... Sidney D. Kirkpatrick
ASSISTANT EDITOR ... Richard V. Reeves
NEWS EDITOR ..... Joseph A. O'Connor
EDITORIAL ASSISTANT ..... Frances Arne
EDITORIAL ASSISTANT ... A. J. O'Brien, Jr.
ART EDITOR ..... Margaret Redfield
SOUTHWEST EDITOR ..... James A. Lee
WEST COAST EDITOR ..... Elliot Schrier
MIDWEST EDITOR ..... Frank C. Byrnes
WASHINGTON EDITORS .... R. S. McBride
G. S. Bryant, Jr., John Kent

PROCESSES AND PRODUCTS

Terramycin: From Dirt to Drug ..... Richard V. Reeves 145
Put Electro Organic Chemistry to Work ..... Marshall Sittig 150
Sulphur ..... Feature Report 165
Chemical Strikes at Soil Erosion 198
Packaged TCC Unit ..... Pictured Flowsheet 210
Why the Furfural Freshet? 217
Product News 198

ENGINEERING AND EQUIPMENT

Control Methods for a Batch Process ..... Theodore R. Olive 140
Finned Tubes Find Process Uses ..... L. C. Johnston 148
Give Mechanical Seals a Chance ..... Dan R. Rankin 152
Controlling Corrosion in a Chemical Plant ..... Clyde W. Day 154
Low-Cost Still Makes Color-Stable Fatty Acids ..... F. B. White 163
Capital Ratios Analyzed ..... H. E. Schweyer 164
Phenolic Cements ..... Corrosion Forum 264
Lead in Modern Chemical Construction ..... Kempton H. Roll 281
Six Ways to Use Ion Exchange 320
Plant Notebook 160
Process Equipment News 178
Equipment Cost Index 179

NEWS AND TRENDS

Chemical Engineering's First Fifty Years ..... Editorial Foreword 139
Petroleum Strong Again? ..... Chemical Economics 339
Chementator 105
Convention Calendar 226
Editorial Viewpoints 158
Process Industry Trends 340
Chemical Engineering News 217
New Construction 342

PEOPLE AND FIRMS

Diary of a Technical Trainee ..... John J. Glover and Harold R. Horner 294
Memo From the Editor 137
Names in the News 304
Readers' Views and Comments 254
Chalmer G. Kirkbride 304
You and Your Job 294
Industrial Notes 319

LITERATURE AIDS

New Technical Literature 206
Chemical Engineer's Bookshelf 333
Quotes, Extracts and Digests 320
Recent Books and Pamphlets 336
Readers Service Section ..... Inside Back Cover

January 1952 CHEMICAL ENGINEERING Vol. 59—No. 1
Member ABC and ABP

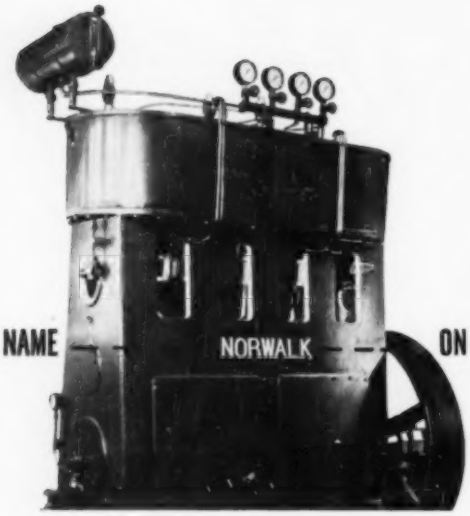
Published monthly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and **Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Chemical Engineering—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders. Chemical Engineering solicits subscriptions only from executives and engineers in companies in which chemical engineering and processing form an important part of the total operation, and from consultants and laboratories whose field includes such process industries.

Single copies 50 cents. Subscription rates—United States and possessions, $3 per year, $4 for two years, $5 for three years; Canada, $4 per year, $6 for two years, $8 for three years; Pan American countries, $15 per year, $25 for two years, $30 for three years; all other countries, single copies $2 each, $20 per year, $30 for two years, $40 for three years. Entered as second-class matter Sept. 3, 1936, at Post Office at Albany, N. Y., under act of March 3, 1879. Printed in U. S. A. Copyright 1952 by McGraw-Hill Publishing Co., Inc. All Rights Reserved.



WHAT THE NAME NORWALK ON A COMPRESSOR MEANS TO YOU

Here are some of the reasons this name is important to those who use air or gas under pressure in their manufacturing processes:

Since 1864 Norwalk has pioneered in the field of high pressure compressors. Norwalk manufactures no other product. With all its eggs in this high pressure basket, Norwalk cannot afford to make any but the best.

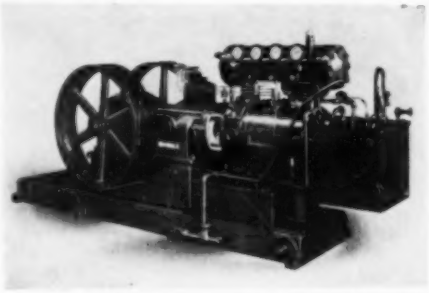
Take the vertical compressor shown above, for instance. Its four stages develop 3000 pounds of pressure. All pistons or plungers are water-cooled. It has a force feed system in the crank case. Though designed as a water-lubricated oxygen compressor, it can easily be adapted for use with other gases. This model has proved highly successful in the field.

Like all Norwalk compressors, this machine is equipped with low and high pressure reversible ring plate valves, and generous cooling surfaces. Accessibility of all valves is one of its main features.

Norwalk compressors are built in two, three, four, five and six stages, and in single and duplex models. As illustrated here, they are made in both horizontal and vertical types.

Every compressor manufactured by Norwalk is set up and test-run for eight hours in the factory—and only after this working test does it receive its final inspection and its approval for shipment.

Any compressor that bears the name NORWALK is a precision instrument on a large scale. If you have a manufacturing problem that requires pressure, it will pay you to send for Catalog 40, a 32-page booklet which describes in detail the Norwalk line of air and gas compressors.



Four stage tandem compressor for handilng air, oxygen, hydrogen, helium, ethylene, natural gas or mixtures.

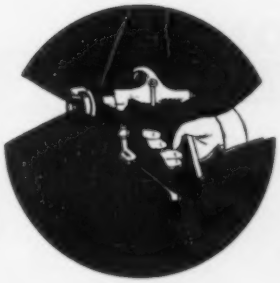
NORWALK COMPANY, INC.

SOUTH NORWALK, CONNECTICUT

Manufacturers of high pressure compressors since 1864

here's how CELLOSOLVE TRADE-MARK SOLVENT increases sales and profits

It readily dissolves resins, dyes, oils, and waxes, and is mild-odored and water-soluble. CELLOSOLVE *solvent is* available for immediate shipment.

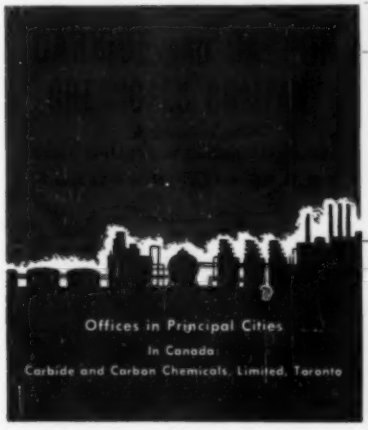


Let CELLOSOLVE solvent help you...

In surface coatings... CELLOSOLVE solvent is an important medium-boiling solvent in nitrocellulose lacquers and phenolic varnishes. Its use imparts improved flow out and helps give you glossy, durable finishes.

As a solvent for dyestuffs... CELLOSOLVE solvent is important in the production of textiles, leather, duplicating fluids, and printing inks. It is a coupler that increases the solubility of textile dyes and gives you brighter shades. When you use it in dyeing leather, CELLOSOLVE solvent improves penetration and contributes better leveling.

As a brake fluid diluent... CELLOSOLVE solvent is an economical, medium-high boiling, stable diluent. Furthermore, it provides good low-temperature properties and is an excellent coupler for other brake fluid components.



PHYSICAL PROPERTIES OF "CELLOSOLVE" SOLVENT

Specific Gravity, 20/20°C.	0.9311
Boiling Point, °C. at 760 mm.	135.1
Dilution Ratio $\frac{\text{½ sec. Nitrocellulose}}{\text{Toluol}}$	4.9
Flash Point, °F (Cleveland Open Cup)	130

CELLOSOLVE solvent is mixible with water in all proportions.

If you need *other glycol-ethers be sure to check Carbide's complete list, including Methyl* CELLOSOLVE *and Butyl* CELLOSOLVE. *For more information, samples, and prices, call or write the Carbide office nearest you. Ask for the 1952 edition of the handy reference booklet, "The Physical Properties of Synthetic Organic Chemicals".*

The term "Cellosolve" is a registered trade-mark of Union Carbide and Carbon Corporation.

AUTOMATIC CONTROL EQUIPMENT

ENGINEERED DESIGN BY HAMMEL-DAHL

"ALL OUT PRODUCTION"

requires

HAMMEL-DAHL "KNOW HOW"

to solve your

Control Valve Problem

FLO-TESTED* DIAPHRAGM CONTROL VALVE 3000 SERIES

These Standard Control Valves are designed for use with air operated instruments for control of pressure, temperature, liquid level, rate of flow, humidity or pH. They can be applied with equal efficiency on air, water, steam, oil, gas or chemical service and are available in sizes from ½" to 12".

The ALLSTEEL Superstructure is fabricated from 3/16" steel stampings. Oilite Bearings eliminate spring stem friction. Stainless steel spring stem standard. Packing box bolted on all size valves. Bonnets and blind heads are forged fabricated. Bonnet will support ALLSTEEL Superstructure if installed horizontally. They are through-bolted for greater strength and also to provide simplicity of field reversal. All valve plugs are top and bottom guided in hardened stainless steel bushings. Valve action reversible in the field, requiring no additional parts.

*Copyright, 1947, by Hammel-Dahl Company

HAMMEL-DAHL COMPANY

243 RICHMOND STREET, PROVIDENCE 3, R. I., U.S.A.

Albany Boston Buffalo Chicago Cincinnati Cleveland Denver Detroit Houston Kalamazoo Kansas City Kingsport, Tenn. Los Angeles New Orleans New York Pittsburgh Salt Lake City San Francisco Seattle Springfield, Mass. St. Louis Syracuse Toledo Tulsa Wilmington, Del.

News about

B. F. Goodrich Chemical Company *raw materials*

Material made from Geon 404 can be welded (1), machined (2), sawed (3), drilled (4).

Rigid plastic developed for chemical industry needs

GEON RESIN 404 provides

- **High impact strength**
- **High abrasion resistance**
- **Light weight**
- **Resistance to many chemicals**

THE many advantages of Geon Resin 404 make it exceptionally useful to the chemical industry. It is a high molecular weight polyvinyl resin which is processed without plasticizer, resulting in far better chemical resistance than that obtained with vinyls which use plasticizers.

This property makes it highly valuable in industries where extreme resistance to chemicals and corrosion is necessary—as in chemical processing, rayon, beverages, plating and food.

Material made from Geon 404 has more unusual advantages. Nails can be driven into it. Nuts and bolts made from it can be threaded. It can be sawed . . . drilled . . . machined on ordinary wood or steel working lathes. Its electrical properties are superior to those of standard plasticized vinyl compounds. For complete information on Geon 404, please write Dept. GF-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

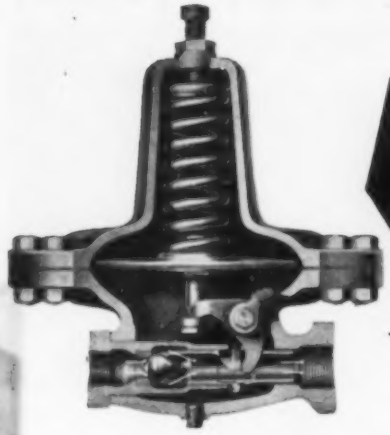
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

10 POINT *Results*

FROM

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE **REDUCING VALVES**

THESE TROUBLEMAKERS FIND NO OPPORTUNITY TO PERFORM WITH THE "1000" ON THE JOB



A MANUFACTURER CHECKS THE 10 POINTS AND SAYS . . .

"We have 3 of these '1000' valves and all of them are giving good service."

THE 10 POINTS ARE CHECKED BY A RESEARCH FOUNDATION, THEY SAY

"These valves have been VERY SATISFACTORY BOTH IN OPERATION and MAINTENANCE. The MAINTENANCE COST IS ABSOLUTELY NOTHING once this '1000' valve is installed. Wherever any one may need CONTROLLED PRESSURE IN EITHER STEAM, AIR, or ANYTHING—this CASH STANDARD '1000' valve can be relied upon to do just that and TO GIVE CONTINUED TROUBLE-FREE service."

A MEAT PACKER SAYS IN CHECKING THE 10 POINTS . . .

"Very little maintenance required."

A STEEL CASTING CO. CHECKS THE 10 POINTS—THEY SAY . . .

"We find your CASH STANDARD Streamlined Type '1000' Pressure Reducing Valves to be VERY RELIABLE. We have a number of these valves in service throughout our plant, and have NEVER HAD ONE OUT OF SERVICE for any reason. These '1000' valves have been in service for approximately five years."

A MOULDED PRODUCTS CO. CHECKS THE 10 POINTS AND SAYS

"Maintenance time and cost very low."

These are the Points
USERS CHECK WITH . . .

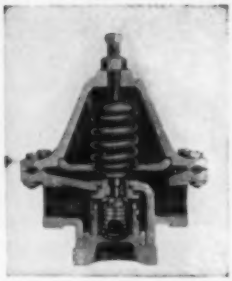
1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

→ ***WRITE FOR BULLETIN 962***

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

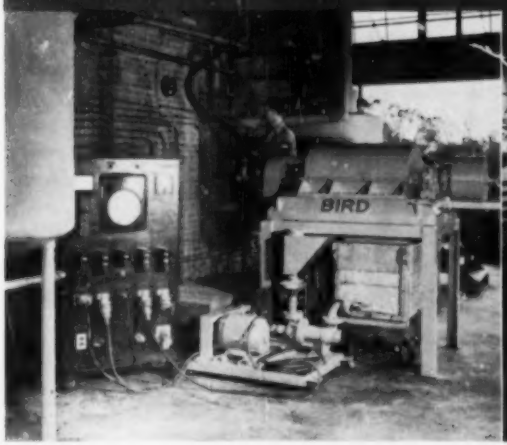
HERE'S WHERE YOU GET
THE ANSWERS TO YOUR SLURRY FILTRATION PROBLEMS

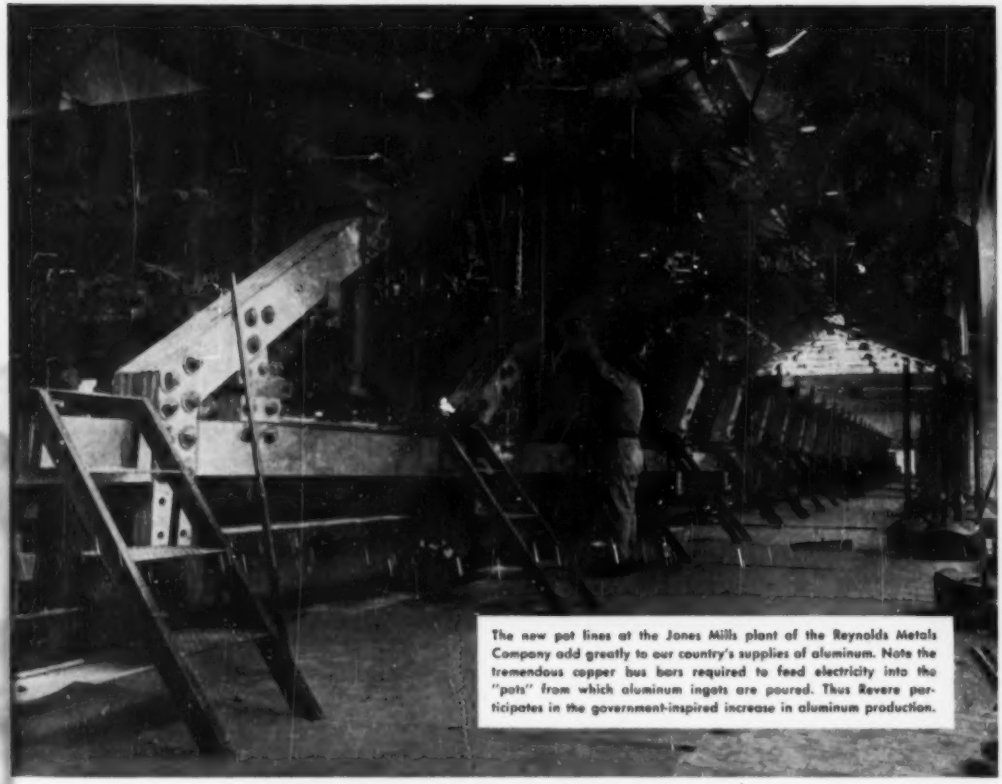
BIRD builds all the types of separating equipment pictured below. Findings are therefore unbiased.

The Bird Research and Development Center is set up expressly to develop accurate, dependable, pilot scale test results.

Why not take advantage of these comprehensive facilities.

BIRD MACHINE COMPANY • South Walpole, Mass.





The new pot lines at the Jones Mills plant of the Reynolds Metals Company add greatly to our country's supplies of aluminum. Note the tremendous copper bus bars required to feed electricity into the "pots" from which aluminum ingots are poured. Thus Revere participates in the government-inspired increase in aluminum production.

It takes a lot of REVERE COPPER BUS BAR to increase aluminum production

● The Government has directed Revere to produce millions of pounds of copper bus bar for the new aluminum plants being put into operation in order to increase the output of this light metal that is so essential to defense. Copper is the ideal metal to carry the heavy currents required for the "pots" that produce aluminum from the ore. Thus aluminum and copper are intimately linked together. Aluminum is used in planes, ships, weapons, missiles, ammunition, and in many other defense applications. Copper, best of all the commercial metals in electrical conductivity, likewise has many vital tasks to perform for our armed forces, afloat, ashore, and in the air.

Revere is glad that its large capacity for the production of bus bar is so valuable in these times; in our long history of over 150 years of service we have always given everything possible in times of our country's need. However, we are regretful that today's government requirements materially limit our ability to fill civilian orders. We look ahead, eagerly and hopefully, to the time when the present urgent demands are met to such an extent that orders for bus bar and other Revere products can be filled more promptly.

REVERE

COPPER AND BRASS INCORPORATED

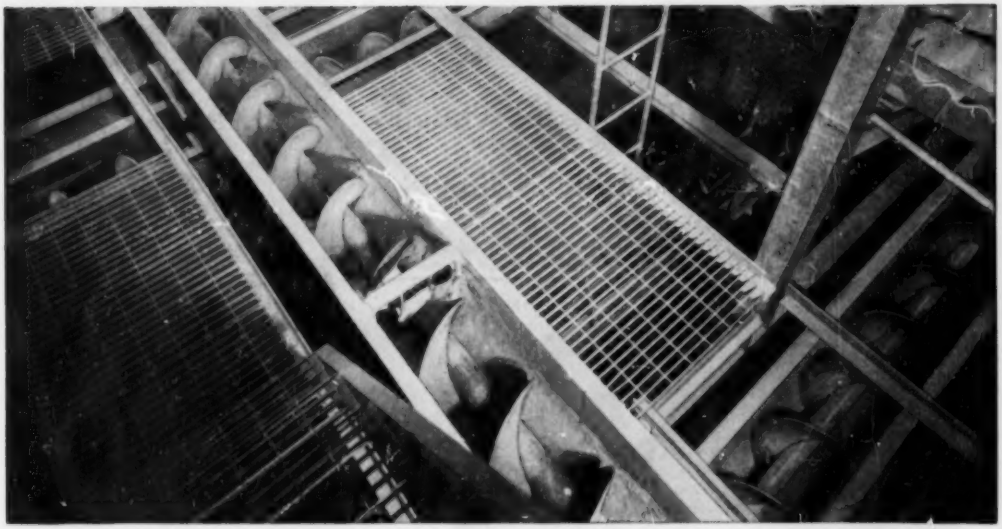
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

* * *

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



This Link-Belt 12-inch screw conveyor delivers screened mixed material to four 12-inch diameter reversible screw conveyors. These distribute to 16 raw-material storage bins through a series of discharge gates and chutes.

There's no substitute for "total engineering" in screw conveyors

LINK-BELT integrates all components to give you the right screw conveyor for your job

HERE'S how "total engineering" works for you when you buy Link-Belt Screw Conveyors.

First, conveying specialists analyze your problem. Then, Link-Belt's vast experience in design and manufacture is at your command to recommend the screw conveyor—or system of conveyors—for your particular requirements. The right components are then selected from Link-Belt's complete range of types and sizes.

Link-Belt "total engineering" on your screw conveyors is your assurance of efficient design . . . balanced performance.

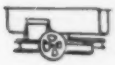
To benefit from Link-Belt's materials handling experience and engineering service, contact the Link-Belt office near you.

LINK-BELT designs and builds all components

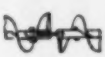
SCREWS—Link-Belt makes a complete range of conveyor screws—Helicoid, Sectional Flight, Cut Flight, Ribbon Flight, Paddle type and other special types for such diverse applications as feeding, conveying, mixing, agitating, stirring, blending, etc.

HANGERS—Available in a variety of styles and mountings, with various bearing materials and steel or cast hanger frames.

TROUGHS—Link-Belt builds flanged, angle flanged, flared, rectangular, dust-seal, jacketed and drop-bottom types in steel or alloy metals. Variety of connections, supports, covers and clamps offers added design flexibility.

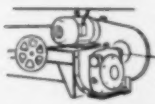


SPOUTS & GATES—Plain discharge spouts can be fixed or detachable. Discharge gates, flat or curved slide, can be hand or rack-and-pinion operated.



SHAFTS & COUPLINGS — Conveyor couplings and end shafts are designed for adequate torsional strength and have jig-drilled coupling bolt holes for accurate alignment

TROUGH ENDS—Steel or alloy metal plate or cast trough ends to match all trough shapes, provide required shaft bearing support and alignment. Seal glands to protect bearings, if required.



DRIVES — Link-Belt designs and builds many forms of drives to suit specific conditions—Enclosed gear, Electrofluid, P.I.V. variable speed, and chain drives of various types.

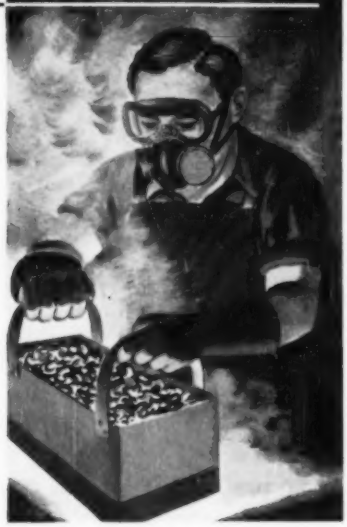
LINK-BELT

SCREW CONVEYORS

12,084

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities.

Get Comfortable, Reliable Protection Against Light Organic Fumes, Vapors, Gases with the **AO R5051 RESPIRATOR!**



This compact respirator with its R51 cartridges is specifically designed to protect against respiratory hazards encountered in paint spraying, degreasing, dry cleaning, cementing and similar operations. The cartridges absorb fumes of benzene, xylene, toluene, gasoline, naphtha, acetone, turpentine and other organic vapors and gases. Recommended also for protection against DDT and other insecticide sprays having a volatile carrier. APPROVED BY THE U. S. BUREAU OF MINES (BM-2304). Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

- Respirator quickly converts into any of 7 types of respirators. One face piece and interchangeable filters or cartridges protect against many respiratory hazards.
- Face piece designed to permit maximum vision.
- Valve design and location make breathing easy.
- Pressure pull of headband cannot distort pliable rubber face piece.
- Available with AO's 701 Chemical Goggle permanently riveted to respirator or with goggle removable by means of snap fasteners.
- Ask your AO Safety Products Representative about the many features that make this respirator outstanding.

AO's Industrial Program increases production, decreases accidents. Write today for free booklet "Improved Industrial Vision."

American Optical Company
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Only with B. F. Goodrich grommet belts can you make these savings!

Save 3 ways! Investigate today! Write or mail coupon

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

What is a grommet?

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Send for proof

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted all others. Some typical cases:

"... within a few days ordinary belts had stretched ... After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all ..."

"Ordinary belts lasted only 5 or 6 weeks ... B. F. Goodrich grommet belts are in their sixth month of service ..."

"Previous belts suffered from shock loads, wore out fast ... BFG grommet belts have been in service 2 years with no shut-downs..."

There are hundreds of cases like these.

They cost no more

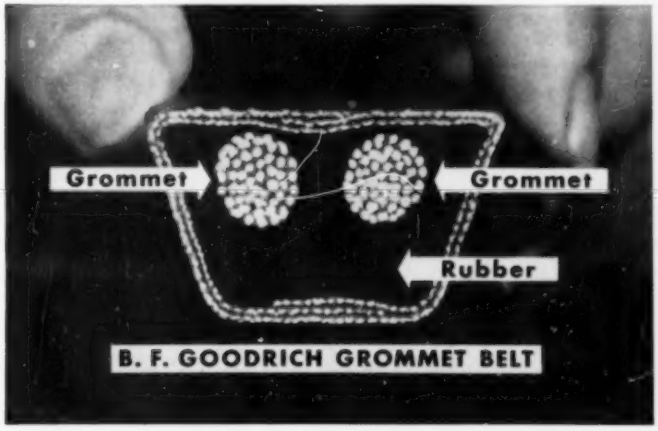
BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

Grommet V Belts BY

B.F.Goodrich

FIRST IN RUBBER



The B. F. Goodrich Company
Dept. CE-1
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name_____

Firm Name_____

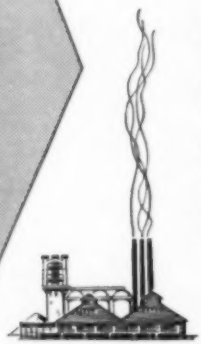
Street Address_____

City_____

State_____

chemicals for industry and laboratory

INDUSTRIAL CHEMICALS FROM HARSHAW CHEMICAL



- Electroplating Salts, Anodes and Processes
- Driers and Metal Soaps
- Ceramic Opacifiers and Colors
- Fluorides
- Preformed Catalysts, Catalytic Chemicals
- Glycerine
- Synthetic Optical Crystals
- Agricultural Chemicals
- Fungicides
- Chemical Commodities

THE HARSHAW CHEMICAL CO.
CLEVELAND 6, OHIO
Cleveland • Chicago • Cincinnati • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh

LABORATORY APPARATUS & CHEMICALS FROM HARSHAW SCIENTIFIC

Harshaw Scientific Division of The Harshaw Chemical Co. is a logical expansion of Harshaw's progress in the chemical field. Laboratories need apparatus and chemicals to carry on their work. Thousands of items are carried in stock by Harshaw Scientific. Your requirements can be filled, whether you need chemicals and apparatus for a single experiment, or to furnish a complete laboratory. Branch offices and stocks are maintained in convenient locations to help you obtain your requirements within a short time.

HARSHAW SCIENTIFIC
DIVISION OF THE HARSHAW CHEMICAL CO.
CLEVELAND 6, OHIO
Cleveland • Cincinnati • Detroit • Houston • Los Angeles • Philadelphia

Utilizing ENDURO *Stainless Steel, Eastman Kodak Company has developed this fast, safe continuous process which replaces the old slow method of making silver nitrate crystals by evaporation in open porcelain dishes.*

ENDURO STAINLESS STEEL

Makes Continuous "Photo Silver" Process Practical

● Near-perfect purity is essential for silver nitrate crystals, chief ingredient of photographic emulsions. Neither contamination products, nor contamination from process equipment, can be tolerated.

That's why, in Eastman Kodak Company's relatively new continuous process for manufacturing "photo silver," all product-contacting surfaces are ENDURO Stainless Steel. The 75-pound silver ingots—99.97% pure—are dissolved with nitric acid in ENDURO containers. Crystals are formed and grown in 1000-gallon ENDURO tanks, spun in ENDURO baskets and dried in ENDURO dryers.

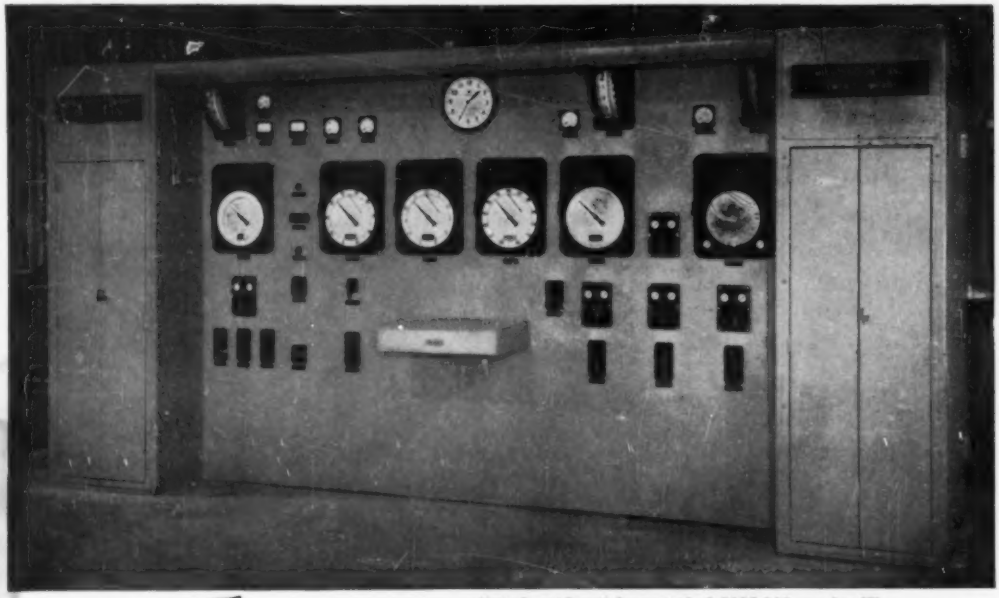
Here, ENDURO resists the action of silver-dissolving nitric acid. It faithfully protects the purity of the silver salts. ENDURO does not contaminate metallically. It resists rust and corrosion, is remarkably easy to clean and to keep clean, discourages the accumulation of possible contaminants.

Have you a special problem—in process or product? Republic—world's largest producer of alloy and stainless steels—offers you the confidential services of technical and metallurgical staffs. Your letter will bring prompt and competent assistance on any development work involving the use of stainless steels. Just write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division · Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic
REPUBLIC STEEL
ENDURO STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Bolts and Nuts, Tin Plate, Tubing, Niles Barrels and Drums



Main Panel Board for control of 3000 bbl per day Kiln at Missouri Portland Cement Company, St. Louis, Missouri.

3 Ways Better

...Bailey Control for Rotary Kilns

Bailey Control for Rotary Kilns gives you better performance three ways:

1. Economical Operation
2. Uniform Quality of Product
3. Reduced Maintenance

These are advantages which can be achieved when all phases of kiln operation are coordinated to work together as a team. Here's how Bailey Kiln Control can help you get all three.

ECONOMICAL OPERATION

With Bailey Combustion Control you can be certain that you are getting maximum product for every unit of fuel you burn. Bailey Control closely guards the Fuel-Air Ratio, Hood Draft, Fuel Feed, Clinker Cooling and the Temperature of Air for Combustion.

UNIFORM QUALITY OF PRODUCT

Bailey Instruments and Controls can help you achieve a uniform high grade product. Measurements of temperatures, kiln speed, combustibles content, and oxygen content can be transmitted to recorders on centrally located control boards like the one shown. There is no sacrifice of accuracy or speed of response. High temperature alarm contacts may also be provided with Bailey Pyrometers as a further aid in achieving optimum uniformity of product.

REDUCED MAINTENANCE

By maintaining uniform temperatures and excess air conditions in the kiln, Bailey Controls help to reduce to a minimum costly refractory repairs and wear and tear on auxiliary equipment.

Bailey Meter Company has a staff of engineers who are experts in the control of rotary kilns. Assure yourself of optimum kiln performance. Let one of these men help plan your Kiln Control System. P-22

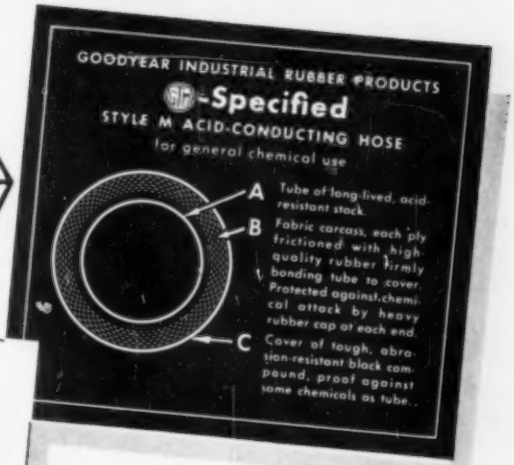
BAILEY METER COMPANY

1054 IVANHOE ROAD • • • CLEVELAND 10, OHIO

TEMPERATURE	FLOW
PRESSURE	LEVEL
% OXYGEN	DENSITY
% COMBUSTION	RATIO

Check YOUR HOSE NEEDS

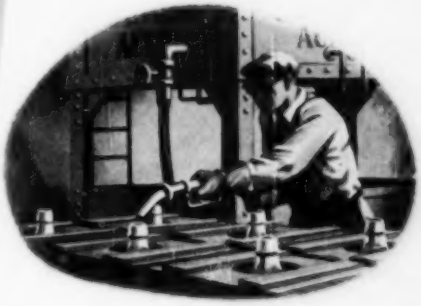
and meet them with this one hose!


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
AR-Specified
STYLE M ACID-CONDUCTING HOSE
for general chemical use
A Tube of long-lived, acid-resistant stock.
B Fabric carcass, each ply frictioned with high-quality rubber firmly bonding tube to cover. Protected against chemical attack by heavy rubber cap at each end.
C Cover of tough, abrasion-resistant black compound, proof against some chemicals as tube.

GOODYEAR STYLE M ACID HOSE
Handles All These Chemicals:

ACIDS	Maximum Concentration	Maximum Temperature in Degrees F.
Arsenic	ALL	150
Acetic	50%	100
Carbonic	50%	150
Citric	ALL	150
Fluoboric	ALL	150
Fluosilicic	ALL	150
Formic	ALL	150
Hydrobromic	ALL	100
Malic	ALL	100
Phosphoric	ALL	150
Sulfuric	75%	150
Tannic	50%	125
Tartaric	ALL	150
Hydrochloric	36% (or Conc.)	150
BASES		
Ammonium Hydroxide	50%	100
Calcium Hydroxide	ALL	150
Magnesium Hydroxide	ALL	150
Potassium Hydroxide	ALL	200
Sodium Hydroxide	ALL	200
SALTS		
Copper Sulphate	ALL	150
Ferric Chloride	ALL	150
Sodium Acid Sulphate	ALL	150
Sodium Carbonate	ALL	150
Sodium Chloride	ALL	150
Trisodium Phosphate	ALL	150
Sodium Sulphide	ALL	150
Sodium Sulphite	ALL	150

Naturally, as concentration and temperature combinations increase, service life may be expected to diminish. However, combinations of the above, in higher concentrations and/or temperatures, are being successfully handled. These are considered individually, as are unlisted chemicals.



FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS *built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor. Look for him in the yellow pages of your Telephone Directory.*

GOODYEAR

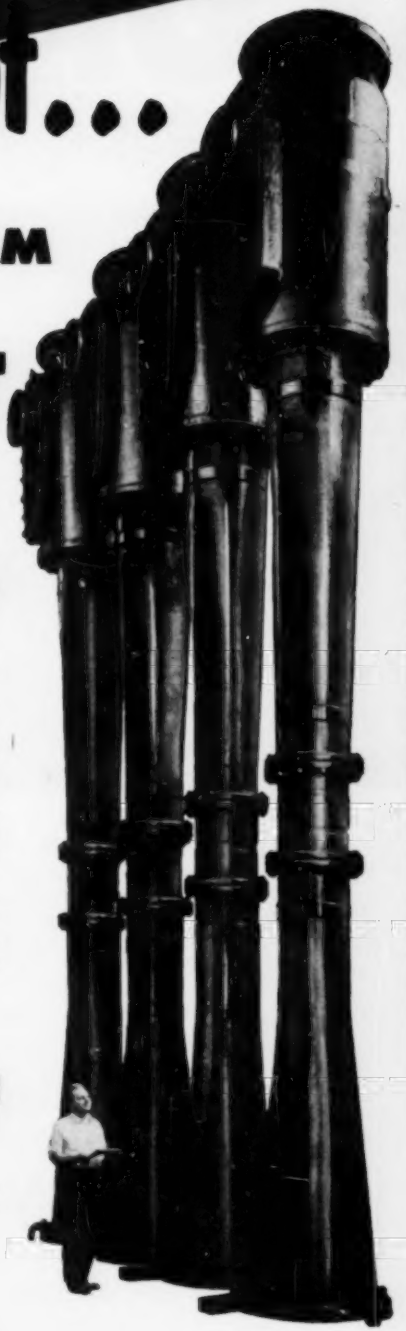
THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"— Every Sunday — ABC Network

ELLIOTT
STEAM JET
EJECTORS
ELLIOTT
STEAM JET
EJECTORS

...or a lot...

GET YOUR VACUUM
WITH
ELLIOTT
Steam Jet
EJECTORS



● If it's low vacuum, with intermittent service, a small priming ejector, as illustrated at left, may do the job. If it's extremely high vacuum, constantly maintained, a multi-stage installation of large ejectors, complete with intercondensers, may be called for. In short, Elliott ejectors — and the "know-how" that goes with them — cover the entire range of commercially obtainable vacuum, including such conditions as the handling of highly corrosive vapors.

Elliott Company's position in the field of vacuum equipment and its application has been a development of years. The resultant valuable experience is at your service with no obligation.

ELLIOTT Company
INDUSTRIAL PROCESS DIVISION
JEANNETTE, PA.

PLANTS AT: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

District Offices in Principal Cities

COPPER

—most versatile metal known to Industry

Liquid Coolers made by L'Air Liquide Society of Montreal, Canada. Each uses 20,000 ft. of tubing which carries liquid air. Tubes are of annealed deoxidized copper, 0.394" O.D. x 0.0394" wall. Tube sheets are cast bronze.

This equipment, known as Liquid Coolers and used in the production of oxygen, is made of deoxidized copper tubing. The combination of properties demanded of copper—high thermal conductivity, ductility and easy workability, strength, resistance to corrosion—illustrates the versatility of copper and explains its great usefulness to industry.

Copper and copper alloys offer the useful properties required for building efficient and economical processing equipment. Depending on composition, they possess combinations of strength, corrosion resistance, high thermal and electrical conductivity, plus free machining, easy forming, and good welding characteristics.

The experience and help of Anaconda's Technical Department are always available to you in selecting the right copper or copper alloy for your needs or for any problem connected with these metals. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 6117

first in Copper, Brass and Bronze **ANACONDA®**

This team can design, build and equip your plant!

Here is a team unique in the chemical and processing fields . . . a team of imagination and ingenuity, with years and years of experience in all phases of engineering. Thoroughly capable of carrying through any undertaking from flow sheet to turn-key operation—on a basis of unified responsibility. Big enough for the biggest job . . . flexible enough for *any* job. This team can competently and economically translate your ideas into an operating plant.

New Chemical Plants headquarters . . . starting point for many advances in the Chemical and Processing Industries.

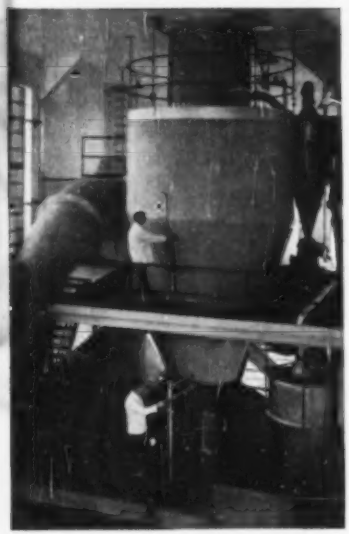
CHEMICAL PLANTS DIVISION

BLAW-KNOX CONSTRUCTION COMPANY

PITTSBURGH 30 • TULSA 1 • NEW YORK 17 • PHILADELPHIA 3 • CHICAGO 3
BIRMINGHAM 3 • WASHINGTON 5, D.C.

—then probably you can profit by

SPRAY DRYING



Above photos were taken inside the Swenson Spray Dryer Laboratory

By test-drying a typical sample in the Swenson Spray Dryer Laboratory, it can quickly be determined whether or not your material is susceptible to spray drying. Such tests may be arranged at reasonable cost.

As the result of data secured during such test runs, our engineers determine the most efficient, economical design for building production equipment.

Swenson Spray Dryers are now at work on a wide variety of materials, many of which were unknown just a few years ago. If you are working with a new material, do not overlook the economies of spray drying in your process. Swenson engineers are glad to offer every possible co-operation.

SWENSON EVAPORATOR CO.
DIVISION OF WHITING CORPORATION
15669 Lathrop Avenue Harvey, Illinois
Eastern Sales Office and Export Department: 30 Church Street, New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 2

WYANDOTTE
CHEMICALS
Application of a new chemical is frequently as important as the chemical itself. We have a staff of skilled chemists whose job it is to help you. Let them!

TRY KREELON CD...NEW, for promoted detergency, superior soil suspension!

Wyandotte KREELON CD combines the advantages of a synthetic detergent *and a detergent-promoter!* It is the only product of its kind on the market.

Test these facts for yourself—*see* how new KREELON* CD benefits you, at an actual *saving in the cost* of your finished product.

Improves your product

KREELON CD combines the advantages of a quality detergent with a detergent-promoter, sodium CMC, in one homogeneous, rapidly dissolving product. Substituted for the alkylarylsulfonate detergent you're now using, in a properly compounded household cleaner, it will give 20%-70% improvement in soil removal and whiteness retention. It promotes smooth, gentle, long-lasting suds . . . reduces skin irritation.

Advantages in compounding

Because KREELON CD acts both as a detergent and promoter, it saves you storage space and handling time. It dissolves rapidly, for *further* time savings. It's dustless—minimizes housekeeping.

Whether you make general household cleaners, laundry compounds, scouring powders, building-maintenance or other cleaners—let us *show* you how KREELON CD can give you a superior cleaning compound *easier, faster, cheaper.* Write for complete data. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in Principal Cities.*

*REG. U.S. PAT. OFF.

Wyandotte CHEMICALS

HNO_3
NH_4OH
N_aCl
H_2O
H_2SO_4
HCl
HEAVY STEEL PLATE
BONDERIZED SURFACE
FORMALDEHYDE-ALHYD-TYPE ENAMEL
THERMOSET VARNISH
THERMOSET VARNISH
FINAL COAT OF GRAY LACQUER

FIVE PLUS BANDS OF PROTECTION

make this the longest-lived chemical motor

You get more protection against corrosive materials with the Westinghouse Life-Line chemical motor than with any other. Take this example:

An Eastern Fuel and Gas Company has a cyanide pump that pumps thyocyanate. At times the pump leaks, throwing thyocyanate over the motor. Conventional motors rotted out at the feet in about six months. A Life-Line installed on this same pump for over a year brought this statement from the foreman of electrical maintenance:

"This is the first motor we did not have to drill out the bolts and screws to take the motor apart. A closer inspection of the motor showed the end brackets and frame in excellent shape; the fan, windings and rotor looked as good as the day they left the motor plant."

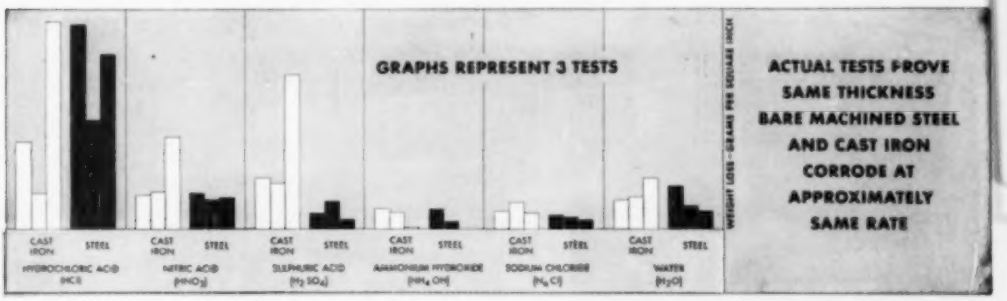
Consider the five plus bands of protection. You'll understand this extra life. The frame, feet, and brackets are steel. (*Note: Steel and cast iron of same thickness have approximately equal corrosion resistance. See graph below.*)

This steel is first Bonderized then a formaldehyde alkyd-type enamel, well known for its superior corrosion resistance, is baked on. Two dips and bakes of tough, flexible Thermoset varnish follow. Finally, the motor is sprayed with a finish coat of gray lacquer. Five bands for longest life!

DO YOU NEED SOMETHING EXTRA IN A MOTOR?

Extra protection against corrosion—or outage from any cause? Check Life-Line—they cost no more. Ask your Westinghouse representative for a copy of Chemical Motor Booklet B-4687, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-21657


GRAPHS REPRESENT 3 TESTS
WEIGHT LOSS - GRAMS PER SQUARE INCH
CAST IRON
STEEL
HYDROCHLORIC ACID (HCl)
NITRIC ACID (HNO_3)
SULPHURIC ACID (H_2SO_4)
AMMONIUM HYDROXIDE (NH_4OH)
SODIUM CHLORIDE (N_aCl)
WATER (H_2O)
ACTUAL TESTS PROVE SAME THICKNESS BARE MACHINED STEEL AND CAST IRON CORRODE AT APPROXIMATELY SAME RATE

YOU CAN BE SURE...IF IT'S

Westinghouse

Life-Line

MOTORS and CONTROLS

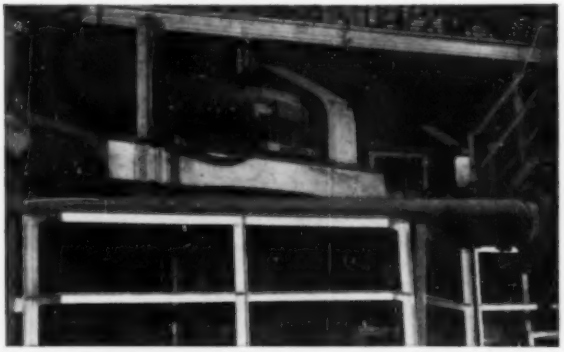
A PHOTO-REPORT ON MODERN

How 3 potash refineries beat corrosion problems with standard G-E motors

Totally enclosed and cast-iron, TRI/CLAD motors stand up to continuous attacks of corrosive-salt solutions

These three potash refineries in the Carlsbad, New Mexico, area rely extensively on standard General Electric totally enclosed fan-cooled Tri-Clad* motors. Strong on corrosion defense, these motors can be located wherever convenient for driving machinery, space economy, maintenance accessibility. And because they're of standard design, initial cost is lower, shipment faster. For more information, write for Bulletin GEA-4131. *General Electric Company, Schenectady 5, N. Y.*

AT U.S. POTASH COMPANY



↑ **Cast-iron enclosures** on Tri-Clad totally enclosed motors are high in corrosion resistance. That's one reason why these motors are ideal for chemical-plant jobs like this, in which a 40-hp, 1200-rpm unit drives a dissolver agitator.

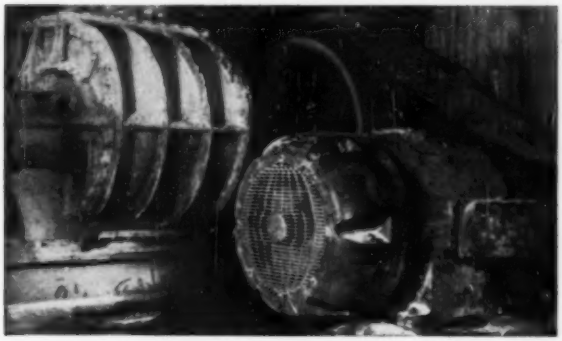
← Driving brine pumps in the refinery, these Tri-Clad motors are rated 30 hp, 440 volts, 1800 rpm. U. S. Potash Company uses dissolvers to separate sodium chloride from potassium chloride in processing the potash salts.

* Registered trademark of General Electric Co.

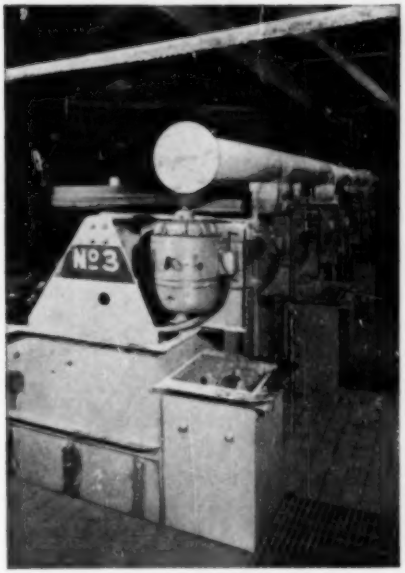
GENERAL ELECTRIC

662-36

AT POTASH COMPANY OF AMERICA

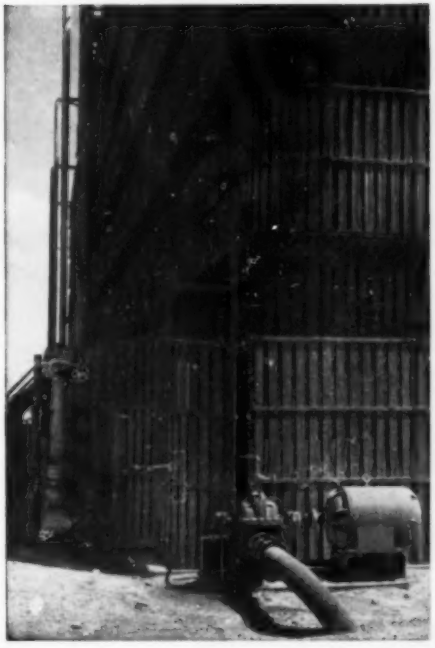


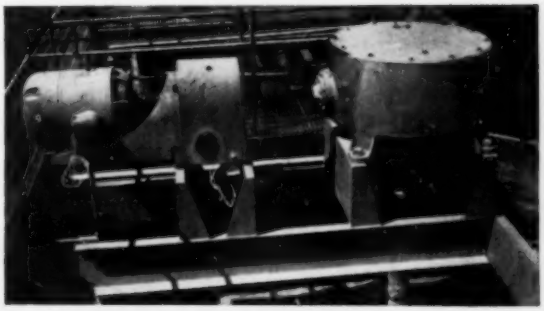
Precision-machined joints assure tight fits to prevent entry of moisture and brine, and bearings are protected against dust as well as corrosion. This Tri-Clad totally enclosed motor—rated 150 hp, 900 rpm—drives the blower for a fines exhauster in the PCA refinery.



In tough flotation-cell service—where production interruptions from motor failure can be quite costly—Tri-Clad totally enclosed motors keep going despite occasional splashing from salt brine. This bank of twelve 5-hp, 220/440-volt, 1200-rpm units drive agitators in the refinery's flotation cells. →

AT INTERNATIONAL MINERAL AND CHEMICAL CORPORATION



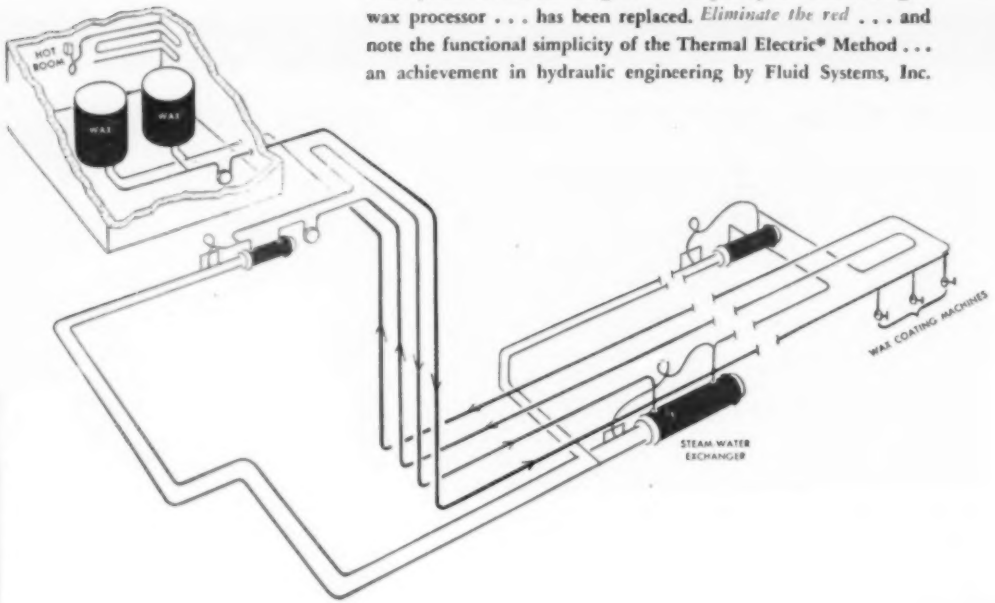


Because of the extra protection afforded by their cast-iron double-wall frame and end shields, Tri-Clad totally enclosed motors have been popular standards for years with chemical plants. This 20-hp, 220/440-volt, 1800-rpm unit requires little or no maintenance in driving a feed-tank turboagitator in the refinery.

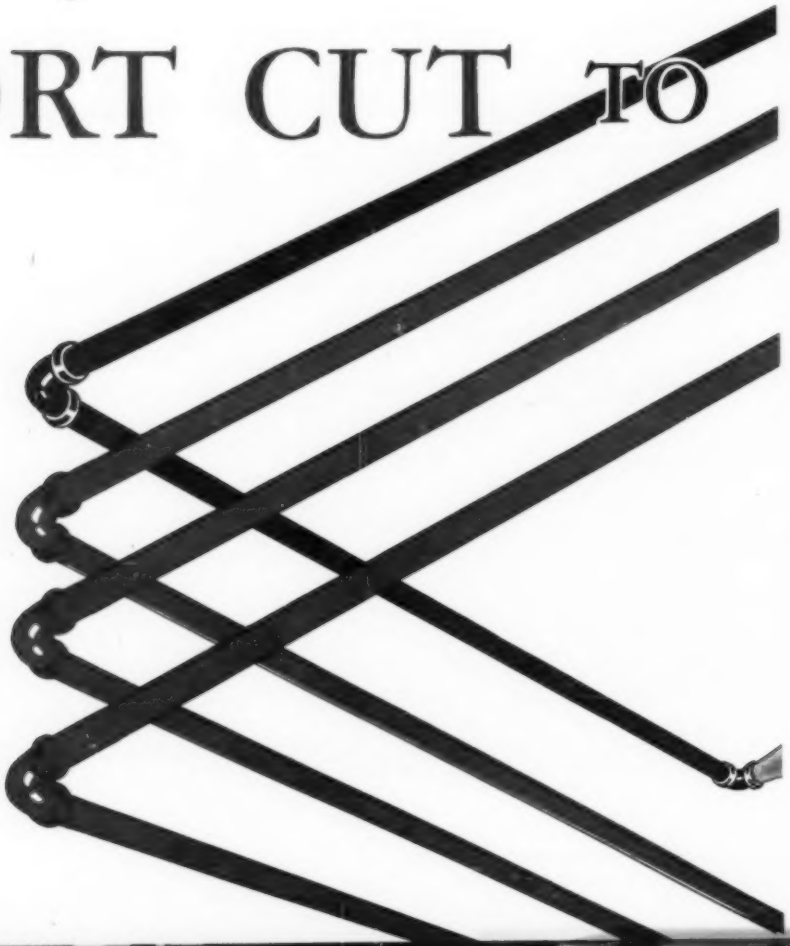
← **Tri-Clad totally enclosed motors** withstand the effects of exposure to weather as well as various chemical-plant brines. This unit—rated 100 hp, 440 volts, 1800 rpm—is located outdoors to drive a circulating pump at the main cooling tower of International Mineral and Chemical Corporation's refinery.

Totally enclosed fan-cooled
MOTORS
for chemical plants

This system of wax handling . . . developed by the world's largest wax processor . . . has been replaced. *Eliminate the red* . . . and note the functional simplicity of the Thermal Electric® Method . . . an achievement in hydraulic engineering by Fluid Systems, Inc.



SHORT CUT TO



WAXLINE ECONOMY

Here's Proof

America's largest wax processors are using it . . . among others:

American Can Company
Lily Tulip Cup Company
Dixie Cup Company
Central Waxed Paper Co.
Newark Paraffin and Parchment Paper Co.
American Paper Goods Co.

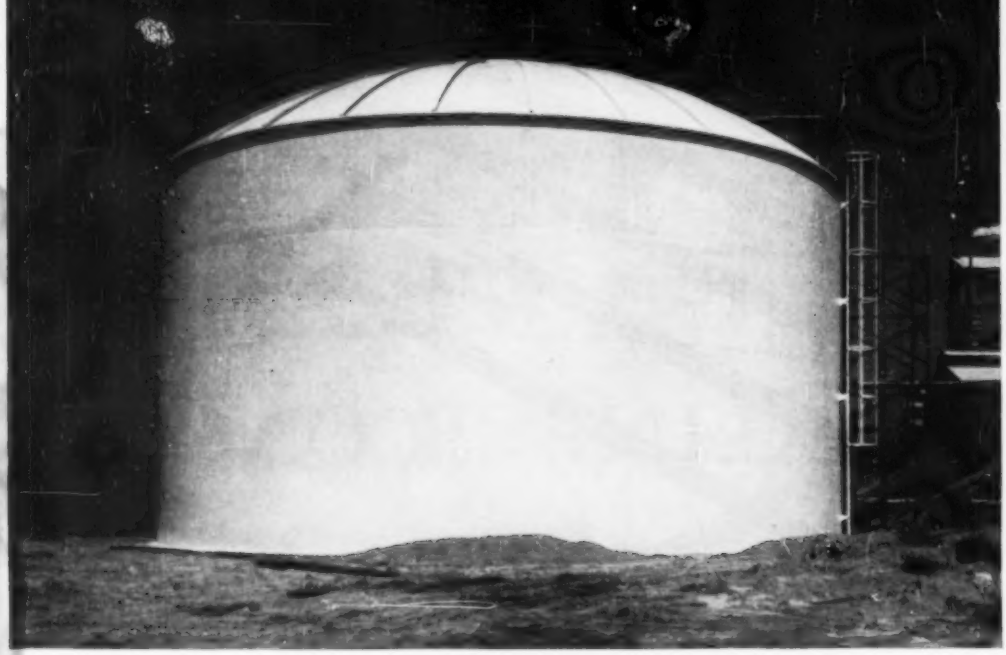
THE PIPELINE THAT HEATS ITSELF

An Invitation

Our intensive specialization has yielded valuable information about viscous fluids and their handling. A request on your letterhead will bring you "Simplified Industrial Fluid Engineering Cuts Costs" . . . a service of Fluid Systems, Inc., 1881 Dixwell Avenue, New Haven 14, Conn.

*Patented and Trade Mark Registered in U. S. Patent Office

THE STORAGE OF CORROSIVE LIQUIDS need not be a tough problem



LION OIL Stores Ammonium Nitrate in Horton Tanks

The storage of corrosive liquids can be completely efficient and thoroughly economical *only* when the proper containers are used. That's why the Chemical Division of the Lion Oil Company stores ammonium nitrate solution in a Horton stainless-clad steel tank at its plant in El Dorado, Arkansas.

All shell and bottom plates in this 15,000-bbl. tank have a 1/16-in. stainless steel cladding. This prevents any metallic contamination of the tank contents due to corrosion.

Stainless-clad steel is one of several corrosion-resistant materials that can be used to build Horton tanks. We also build carbon steel plate structures, such as flat-bottom tanks, spherical and spheroidal pressure storage tanks, cylindrical pressure vessels and elevated water tanks.

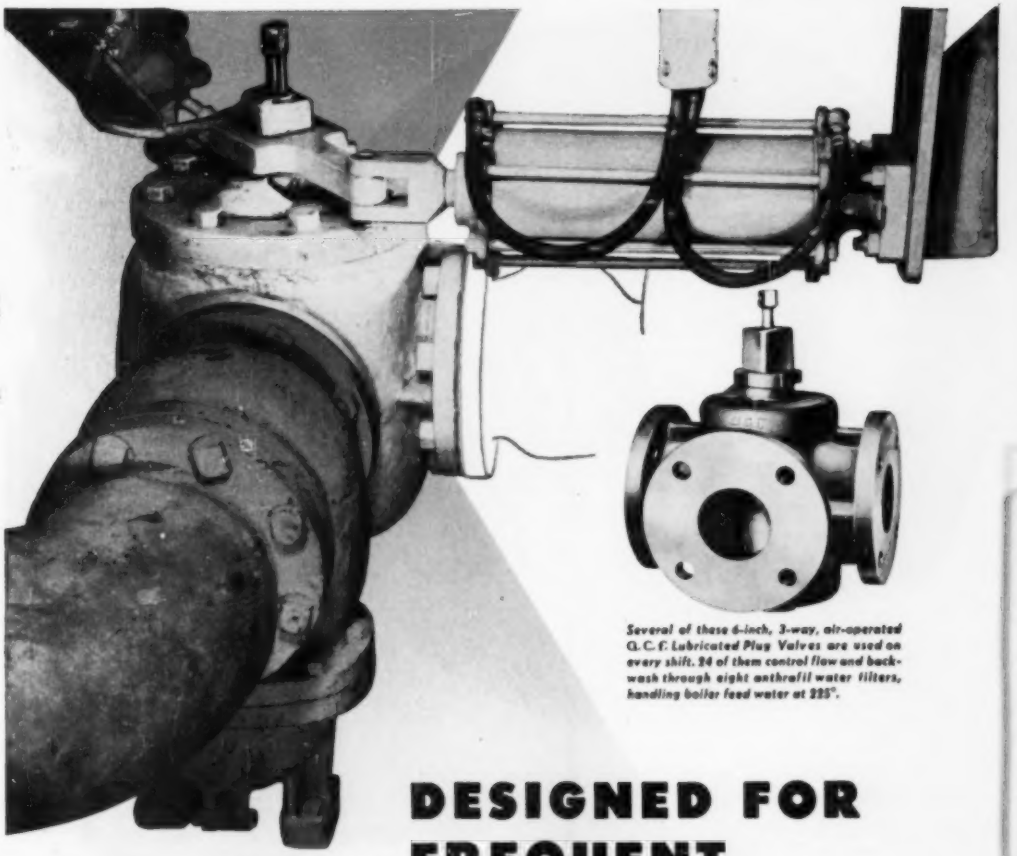
We also have equipment for stress relieving and x-raying—and recently we enlarged our facilities for pickling and painting by the Phoscote Process. Why not let us help you solve your storage problems?

Write our nearest office for complete information or quotations on tanks and plate work. There is no obligation on your part.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2120 Healy Bldg.	Detroit 26	1503 Lafayette Bldg.	Philadelphia 3	1625—1700 Walnut St. Bldg.
Birmingham 1	1510 North Fiftieth St.	Havana	402 Abreu Bldg.	San Francisco 4	1522—200 Bush St.
Boston 10	1005—201 Devonshire St.	Houston 2	2103 C & I Life Bldg.	Seattle 1	1305 Henry Bldg.
Chicago 4	2124 McCormick Bldg.	Los Angeles 17	1505 General Petroleum Bldg.	Tulsa 3	1623 Hunt Bldg.
Cleveland 15	2220 Guildhall Bldg.	New York 6	3318—165 Broadway Bldg.	Washington, D. C.	1160 Cafritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA



Several of these 6-inch, 3-way, air-operated A.C.F. Lubricated Plug Valves are used on every shift. 24 of them control flow and backwash through eight anthrafil water filters, handling boiler feed water at 225°.

DESIGNED FOR FREQUENT OPERATION

When a valve has to be opened and closed several times a day, the right valve may save you many production delays. With air-operated A.C.F. Lubricated Plug Valves, you're sure of fast, easy operation every time. The exclusive A.C.F. CYLINDRICAL plug, being untapered, does not wedge in its seat. Besides, it only takes a quick quarter-turn to open wide or close tight. For speed and 365-day-a-year dependability... A.C.F. CYLINDRICAL Lubricated Plug Valves!

A.C.F. CYLINDRICAL FULL PIPE AREA **PLUG VALVES**

Representatives in more than 50 principal cities

Ask for Catalog 4-CM, American Car and Foundry Company, Valve Division, 1501 East Ferry Avenue, Detroit 11, Michigan

let's take a
CLOSER LOOK
at

CAUSES OF TUBE FAILURES

Transverse failure in stainless steel furnace tubes due to bending stresses from improper support combined with excessive overheating and badly carburized conditions.

Tubes are critical materials. Accelerated production in many process industries is essential to meet defense requirements. These are two urgent reasons for giving extraordinary attention *now* to getting optimum failure-free service from tube installations in chemical process industries.

Of major importance in securing best operating results is an understanding of the numerous factors affecting tube life in high pressure, high temperature applications. Innumerable investigations of tube failures in such service over a 25-year period show that they are most frequently caused by circumstances other than actual physical defects in the tubes themselves. By far the most common causes of failures are overheating, excessive pressures, corrosion, and scaling due to tubes being subjected to improper operating conditions.

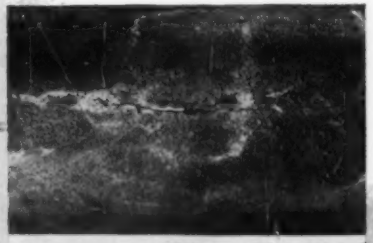
On the opposite page are enumerated some of the more prevalent reasons, based on extensive studies, that account for excessive tube temperatures and attendant failures in petroleum conversion equipment. These are presented in the hope they will aid engineers and operating personnel to get better-than-ever service from their tube installations.

Through Mr. Tubes—your local B&W Tube Representative—is available a wealth of data on the behavior of tubing steels under conditions embraced in modern processing plants. It may pay you as it has so many others to call on this vast source of useful information.

Some Common Causes of Reduced Tube Life and Increased Maintenance

1. Excessive transfer rates in furnace equipment.
2. Coking of tubes – either expected or extraordinary.
3. Failure to clean tubes at regularly scheduled periods.
4. Unexpected radiation from bridge wall or refractory surfaces.
5. Improperly calibrated fuel meters on burner equipment.
6. Increase of product temperature over a safe design limit.
7. Unequal heating around circumference or along tube length.
8. Excessive furnace temperatures.
9. Guessing at tube metal temperatures.
10. Increase of pump pressure of maintain through-put.
11. Abuse during mechanical decoking, or scaling during burningout operations.
12. Improper supports resulting in bending or sagging.
13. Lack of control of furnace atmosphere to retard scaling.
14. Corrosion of ends or body of tube or both.
15. Carburization and exfoliation of carburized layer.
16. Abrasion or erosion due to coke in fluid stream.
17. Leaky header seats.

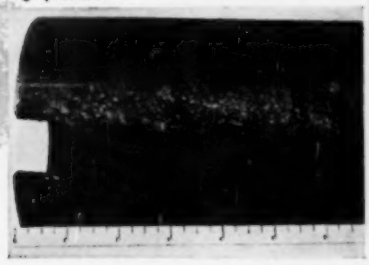
Bulletin TR-516 entitled "Some Experiences in Service", contains more detailed information on this timely subject, and is available upon request.



Stress-rupture failure in carbon steel still tube due to overheating.

Sections of carbon steel tube (top) and chrome-moly steel tube (bottom) which failed due to stress-rupture and oxidation under excessive temperature conditions.

Excessive coke formation caused overheating and rupture in this 18-8 stainless steel still tube under high pressure.



THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 2, Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

TA 1652-5

POWELL VALVES
meet all requirements
of modern industry
That's because Powell makes valves of the right design and materials for every known industrial flow control service.
It is also why there are more kinds of Powell Valves in service today than any other make.
The Wm. Powell Co., Cincinnati 22, Ohio
Fig. 2493. Flanged end O. S. & Y. Gate Valve for 150 pounds W. P. Available in various corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Also made with screwed ends.
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
SINCE 1846

Ready for today's great power expansion

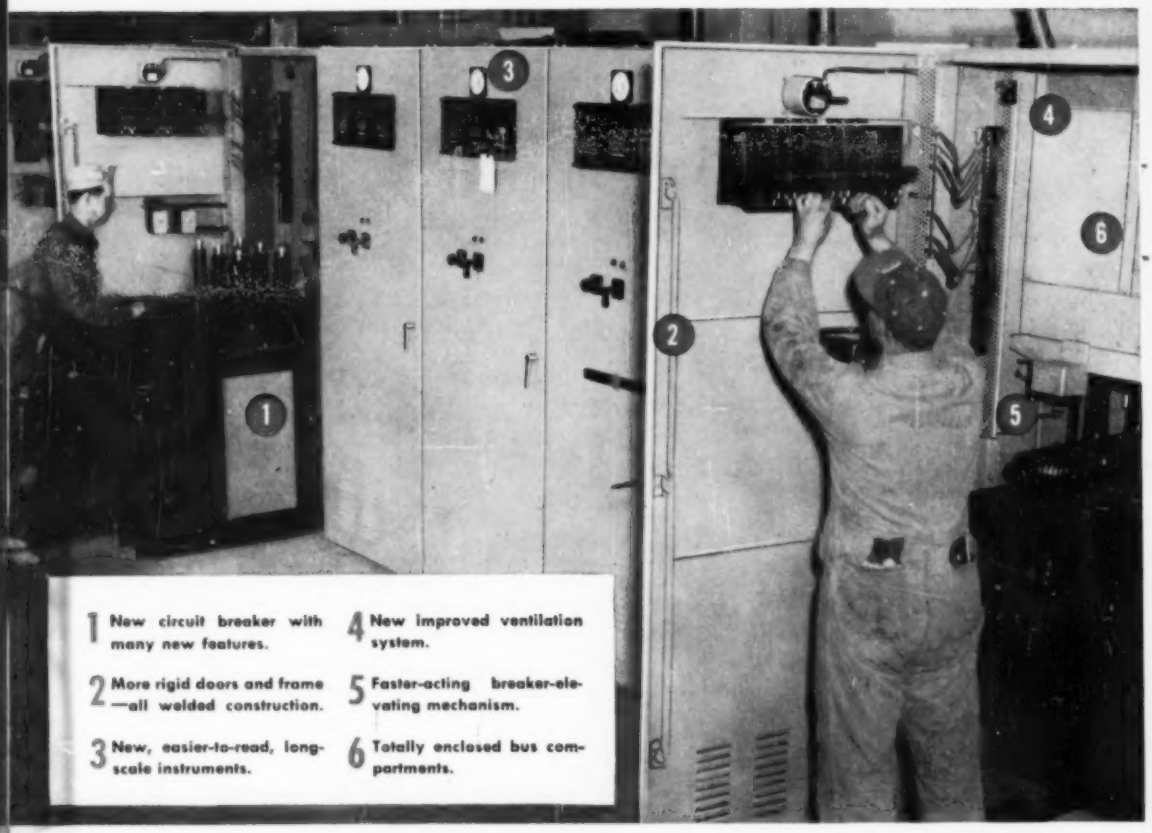
IMPROVED G-E METAL-CLAD SWITCHGEAR

...matched to today's greater "on the job" requirements, and meeting all industry standards.

Already delivered to one of America's largest and newest industrial plants, this improved G-E Metal-clad Switchgear will assure dependable power for a mammoth production job. In the foreground are the 13.8-kv G-E magne-blast circuit breakers for the Metal-clad equipments being installed.

GENERAL ELECTRIC

Improved G-E Metal-clad Switchgear


1 New circuit breaker with many new features.
2 More rigid doors and frame—all welded construction.
3 New, easier-to-read, long-scale instruments.
4 New improved ventilation system.
5 Faster-acting breaker-elevating mechanism.
6 Totally enclosed bus compartments.

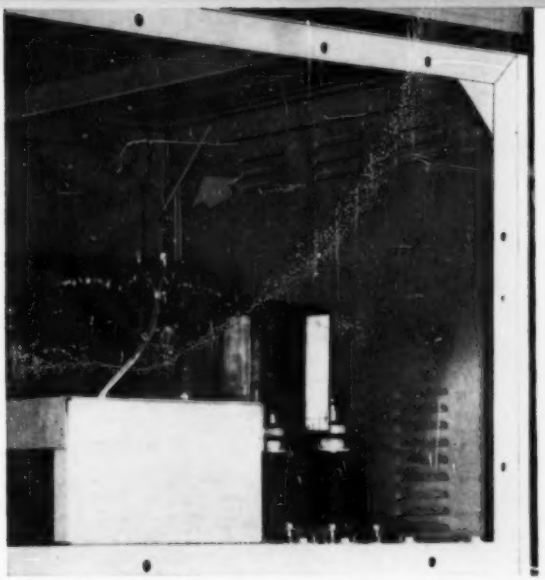
Stronger! Safer! A Wealth of New Features That Contribute to More Dependable Operation!

Pioneered by General Electric in 1935, Metal-clad Switchgear has set new standards of safety and dependability that have made it the accepted power distribution equipment throughout all industry.

Now, with new pace-setting advances in design and construction, it's better than ever, and still maintains the features of visible primary contacts when breaker is lowered to the disconnect position.

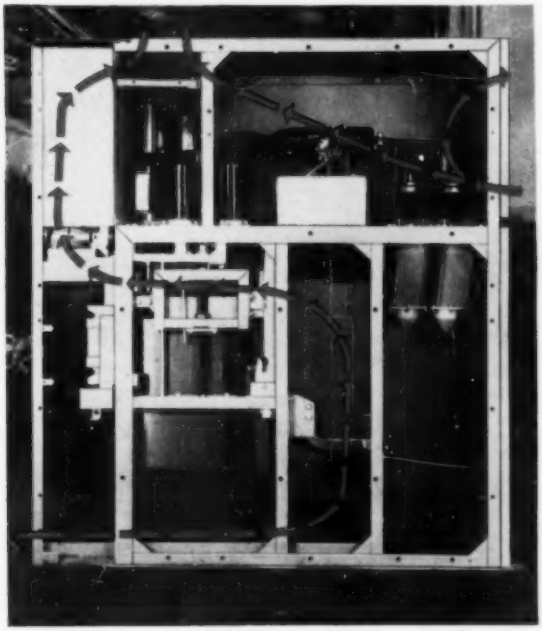
With expanding production schedules calling for more and more electric power, improved G-E Metal-clad Switchgear, in 4.16 kv and 13.8 kv ratings, gives the greatest protection against electrical shut-downs. New advanced features simplify operation and inspection, and provide increased safety for personnel. And with stronger, more rigid construction and simplified design of many components, you get even more dependability.

Only a few of the many new features can be shown here. For full information, see your local G-E Apparatus Sales representative, or write for Bulletin GEA-5664, General Electric Company, Schenectady 5, N. Y.

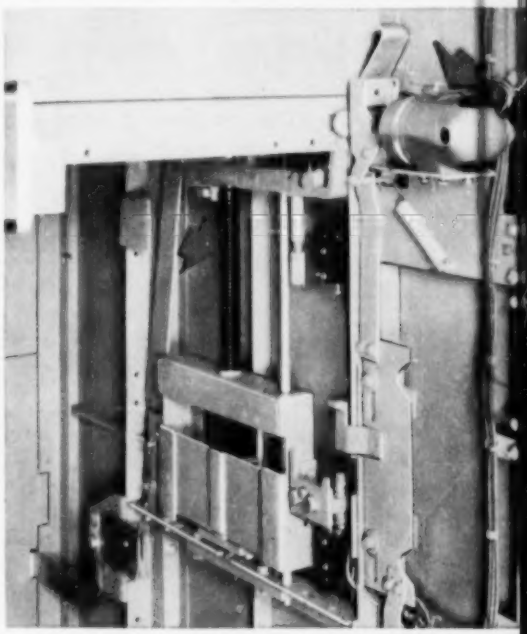


FRAME NOW COMPLETELY WELDED into one solid unit. Gusseted corners (see arrow) provide greater rigidity. Doors have a three-point latch operated from a single handle, and are reinforced against warping by a steel tube at hinge side.

REMOVABLE MAGNE-BLAST CIRCUIT BREAKER features improved flame-retardant insulation and simplified contact design. Breaker operating mechanism and control relay are on the front of breaker for easy accessibility.

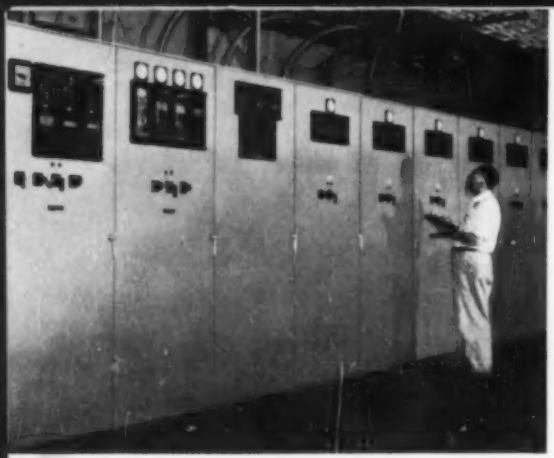


IMPROVED VENTILATING SYSTEM: Arrows show natural draft of air that constantly ventilates entire switchgear unit. The totally enclosed bus compartment, at upper left, is cooled by the circulation of air around it.

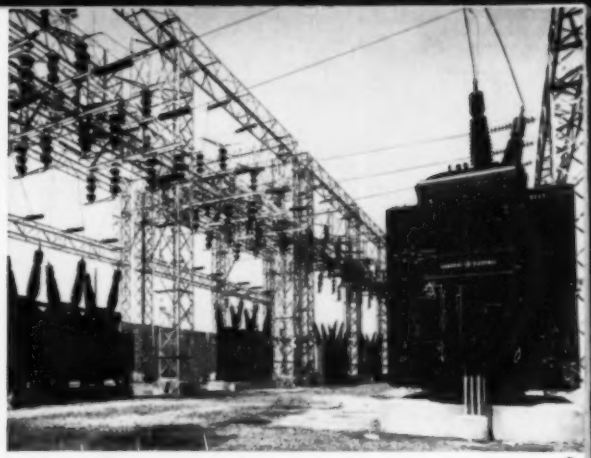


NEW FASTER ACTING BREAKER ELEVATING MECHANISM can raise the removable circuit breaker into position, or lower it for testing, in 30 seconds. A new compact gear-motor drives the simplified jack screw elevating mechanism.

GENERAL ELECTRIC



IMPROVED G-E METAL-CLAD SWITCHGEAR shown installed in new plant. Adequate interrupting capacity of circuit breakers plus total enclosure of all live parts insures maximum protection against electrical failures.



G-E OUTDOOR SUBSTATION built from standardized units, including transformer, oil circuit breakers and steel structure. Use of this equipment enabled this plant to save months in planning and installation.

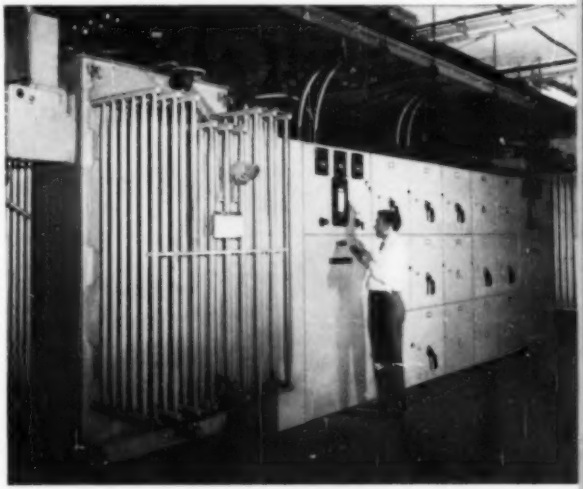
Complete Electrical System from "Packaged" equipment

...Here's the modern trend made possible with G-E equipment

General Electric Vertical-lift Metal-clad Switchgear is only one item in a complete line of factory-assembled "packaged" equipment designed to simplify planning and speed installation of the safe, modern electrical systems required for today's expanding production.

The trend to "packaged" electrical equipment throughout the installation is illustrated by the examples shown on this page. Installed in one of the nation's newest and largest plants, each item of equipment was supplied as a ready-to-use unit. Use of standardized "packaged" equipment enabled this plant to get into production in record time.

Perhaps similar equipment can help you. General Electric engineers stand ready to assist you in solving your particular problems. General Electric Co., Schenectady 5, N. Y.



METAL-ENCLOSED LOAD-CENTER UNIT SUBSTATION, delivered as a "package," supplies low-voltage power to adjacent machines—eliminates need for long, low-voltage feeder system. Unit shown is one of 18 installed in this plant.

Complete data at your finger tips—Write for these helpful bulletins

Full information on modernizing or expanding your electrical system with G-E packaged equipment is given in these three illustrated booklets. Write for GEA-5664 "G-E Metal-clad Switchgear," GEA-3592 "Load-center Unit Substations" and GEA-5600 "Power for Industry's Third and Biggest Expansion."

GENERAL ELECTRIC

854-42

HOW TO HELP BRITAIN ...and Ourselves

The purpose of this editorial is to help Winston Churchill obtain the aid Britain needs

(1) to weather her present financial crisis, and

(2) to avoid a chronic recurrence of such crises.

This is not a philanthropic purpose.

Britain is our staunchest ally in the free world's continuing fight for survival. She cannot perform her role effectively if she is broke, or if she careens from one financial crisis to another.

Then, too, a nation such as ours—committed to private enterprise as a way of economic life—has a special interest in helping Winston Churchill to help Britain. His administration is relatively friendly toward private enterprise. Should he fail, he would be replaced promptly by a Socialist government more hostile than ever. And that would weaken the standing of private enterprise in the free world.

Cause of the Crisis

It is the drive of the Western World under our leadership to rearm against Russian aggression that has precipitated Britain's financial crisis. It set off a scramble for raw materials from which armaments could be made, and for many other materials that might be short in the event of war. So the prices of the things that Britain must import—mostly raw materials—have been boosted more than the prices of things she can export—mostly finished products. That leaves Britain short of funds to pay for essential imports. This difficulty increases as the necessity becomes more urgent to divert industrial effort from production for export to production for security.

The Basic Trouble

Although Britain's immediate crisis was touched off by the rearmament drive of the Western World, her basic affliction is one from which she has suffered since the end of World War II. Stated in its simplest terms, Britain does not produce enough goods to pay her own way as one of the family of free nations.

For years this deficiency in home production was made up by income from shipping and overseas investment. But Britain had to sell a large part of her foreign investments to finance her heroic part in World War II. So her income from that source has been greatly reduced. And, in spite of an increase of about a third above prewar in her own production of goods and—thanks to a continued "austerity" program—a much larger increase in her exports, Britain still is not paying her own way.

Two Ways to Solvency

Britain has two ways to restore her solvency. One is to cut down on what is consumed—the belt-tightening process. The other is to step up British production.

To surmount the present crisis, Mr. Churchill has asked for some cutting down. He probably must ask for more.

Except as a stop-gap expedient, however, more cutting down of Britain's consumption is clearly a dangerous course. That would further depress a British standard of living which, not more than half as high as ours, already is too low. Politically such a course would grease the skids for Winston Churchill's administration, even now governing by a wafer-thin parliamentary margin. Also, as *The* (London) *Economist* remarks, the "lazy expedient of cutting trade" would result in "hurting other people and forcing them to take similar action"—by cutting the market for their products.

The Only Cure

The best and, in fact, the only way to help cure Britain's economic ills is to help Britain produce more. Here the technical possibilities are encouraging. On the average, the British industrial worker produces only about 40 percent as much a year as the American worker. That is a British estimate, made by Sir Ewart Smith.

Wider use of better industrial methods and modern tools and an infusion of the competitive incentive into British industry — to replace the cartel and other restrictive practices — would go a long way to narrow this wide gap in worker productivity. This is the consensus of experts on both sides of the Atlantic.

Since 1948 the Anglo-American Council on Productivity has done much to encourage output per man-hour in Britain and to foster this doctrine with both labor and management. But much yet remains to be done.

In the United States it is increasingly suggested that before we give Britain any more economic aid we should insist that everything possible be done to exploit the technical possibilities of increased production. This emphasis on production is needed. But if we Americans were to impose upon the hard-pressed British people conditions that could be construed as an affront to a friendly and sovereign nation, we might well put into the hands of a masterful rabble-rouser such as Aneurin Bevan, the anti-American leader of the Labor Party's left wing, a campaign issue on which to maneuver himself into the Prime Ministership.

Churchill Can Insist

But Winston Churchill is not so handicapped as we should be in imposing prerequisites of further aid. As Britain's own, most honored leader he will raise no touchy questions as to Anglo-American relations if he insists that Britain have firm plans to cure her economic ills, plans sharply focussed on ways and means of increasing Britain's industrial efficiency.

By presenting a convincing plan to cure Britain's recurring crises through greater production, Mr. Churchill will greatly facilitate the process of getting the aid his country must have. He will also remove an increasingly dangerous element of dissension in Anglo-American relations—the feeling of many Americans that more aid to Britain is more money down the drain. The way to counter that feeling is to come up with a prescription for an economic cure, not a request for another economic poultice.

Technically, such a program is entirely feasible. It will perhaps be the supreme test of Winston Churchill's statesmanship to make it politically feasible as well.

In the interest of Britain, of the United States and of the whole free world, we wish him all success.

McGraw-Hill Publishing Company, Inc.

Can You Tell Which of These Nordstrom Valves Are Designed for Chemical Services?

A

Fig. 1725 MA-4

B

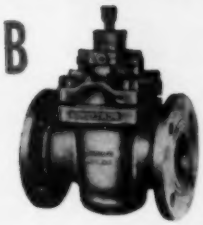


Fig. 1815

C

Fig. 614

A. This Nordstrom Valve is built of Type 316 Stainless Steel. It's recommended for oxidizing conditions such as nitric acid reactions. It is resistant to most organic acids and inorganic salts and alkalies.

B. Made of Monel, this valve is used in the food industries, along with nickel and stainless steel, for resistance to rust and corrosion. Sulphuric acid under reducing conditions may also be handled by it.

C. Like most Nordstrom process valves, this valve is available in screwed or flanged ends, straightway or multiport body patterns. It is Nordco Bronze, which is an acid resistant bronze for dilute sulphuric acid, organic acids, inorganic salts and alkalies.

D. A three-way Nordstrom Multiport valve may replace several straightway valves in process lines and also eliminate other fittings like tees and elbows. This valve is semi-steel, usually used in lines with cast iron pipe and fittings.

E. Often in batching, blending and other process applications, a gear operated valve may be needed. Here, a Nordstrom Hypreseal valve, for pressures to 2500 lb, is equipped for gear operation.

F. For handling caustic liquors in the sulphate pulp industry, viscose rayon plants, etc., this Nordstrom Valve of Type 2 Ni-Resist is widely used. It is also used in plastic and food industries and elsewhere where freedom from copper contamination is desired. It is also resistant to hydrogen sulphide as encountered in sulphide water, industrial water and petroleum oils.

G. Nordstrom valve of Hastelloy B, with Merchrome hard faced plug, is resistant to acid chlorides such as ammonia or zinc chloride. Not recommended for oxidizing conditions.

D

Fig. 3402

E

Fig. 1949

F

Fig. 5314

Fig. 29225 MA-3

In short, all of these Nordstroms are recommended for some types of process installations.

Nordstrom now builds a wide range of lubricant sealed valves for the chemical and process industries—many body patterns and pressure classes, sizes for nearly every line, flanged or screwed ends and a variety of most commonly specified erosion and corrosion fighting metals.

They're all described in the new bulletin, "Nordstrom Valves and Rockwell Meters for the Process Industries." Write for your copy.

Rockwell Built

Another Rockwell Product

Nordstrom Valves

Lubricant Sealed to Keep Upkeep Down

Rockwell Manufacturing Company

400 N. Lexington Ave., Pittsburgh 8, Pa.

Rockwell Manufacturing Company N-5293A
400 N. Lexington Avenue
Pittsburgh 8, Pennsylvania

Please send me the new bulletin "Nordstrom Valves and Rockwell Meters for the Process Industries"

Name_____

Company_____ Title_____

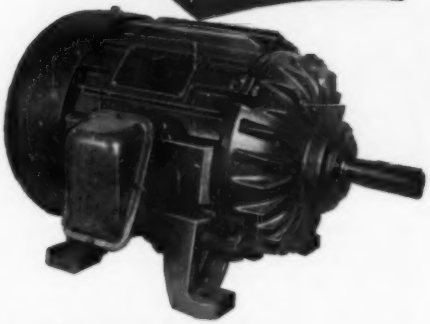
Street_____

City_____ Zone____ State_____

ALLIS-CHALMERS

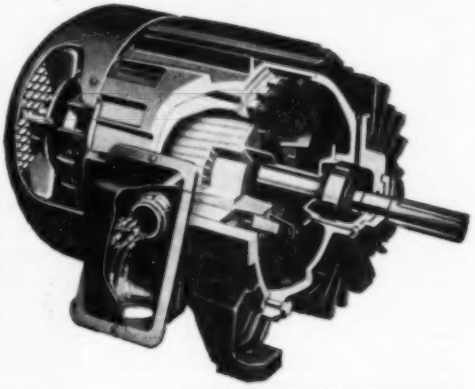
Totally-Enclosed Fan-Cooled MOTORS

Look Outside



Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high, regardless of operating conditions. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can be easily kept clean and cool running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.

Look Inside



Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Die cast rotor and interphase insulation are further assurance of long life and low maintenance.

See WHY THIS IS YOUR BEST MOTOR BUY

HERE IS A MOTOR that is different from conventional TEFC motors; built with an entirely different cooling system that gives you big savings in lower maintenance, more continuous service and less trouble in the toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZ TEFC motor since areas that might collect dirt are exposed and easy to clean.

GET DETAILS NOW — *Ask your nearby Allis-Chalmers Authorized Distributor or District Office for more complete information on this high performance TEFC motor. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.* A-3578

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

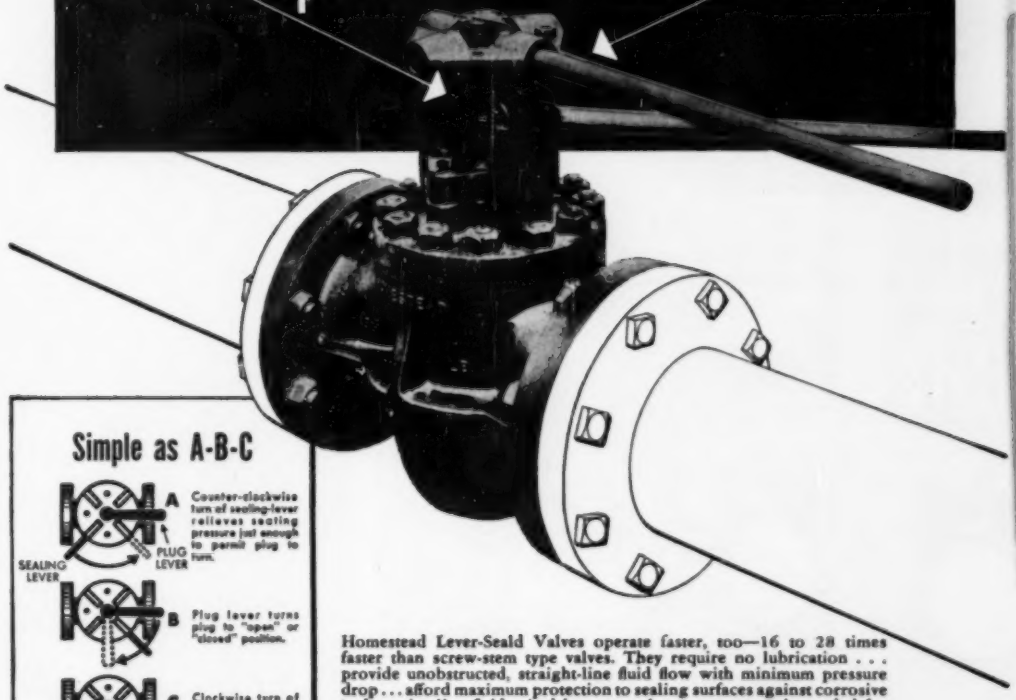
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

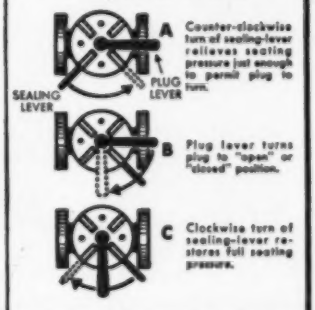
- **at all times**
- **under all conditions**
- **throughout its long lifetime of service**

This Homestead Valve will always work

it's stickproof because it's lever-seald



Simple as A-B-C


SEALING LEVER
PLUG LEVER
A
Counter-clockwise turn of sealing-lever relieves seating pressure just enough to permit plug to turn.
B
Plug lever turns plug to "open" or "closed" position.
C
Clockwise turn of sealing-lever restores full seating pressure.

Homestead Lever-Seald Valves operate faster, too—16 to 28 times faster than screw-stem type valves. They require no lubrication . . . provide unobstructed, straight-line fluid flow with minimum pressure drop . . . afford maximum protection to sealing surfaces against corrosive and erosive line fluids. And because only a quarter-turn is needed for full opening or closing, they are ideal for installation in restricted areas where operation of other types of valves might be difficult.

Next time you have damaged or sticking valves, replace them with Homestead Lever-Seald Plug Valves. Once you use them you'll never be satisfied with ordinary valves.

For complete information write for Valve Reference Book No. 39-3.

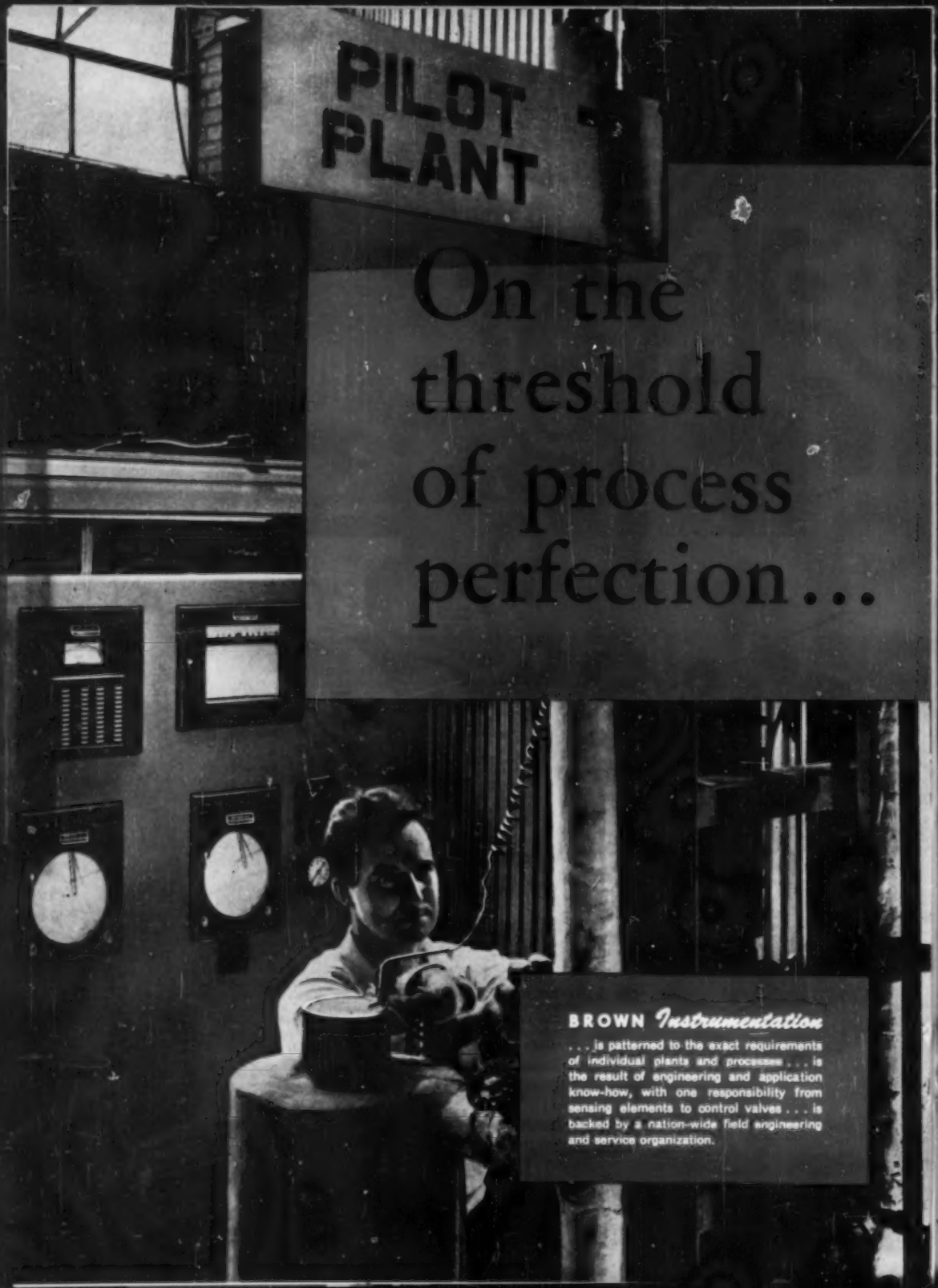
HOMESTEAD LEVER-SEALD PLUG VALVES

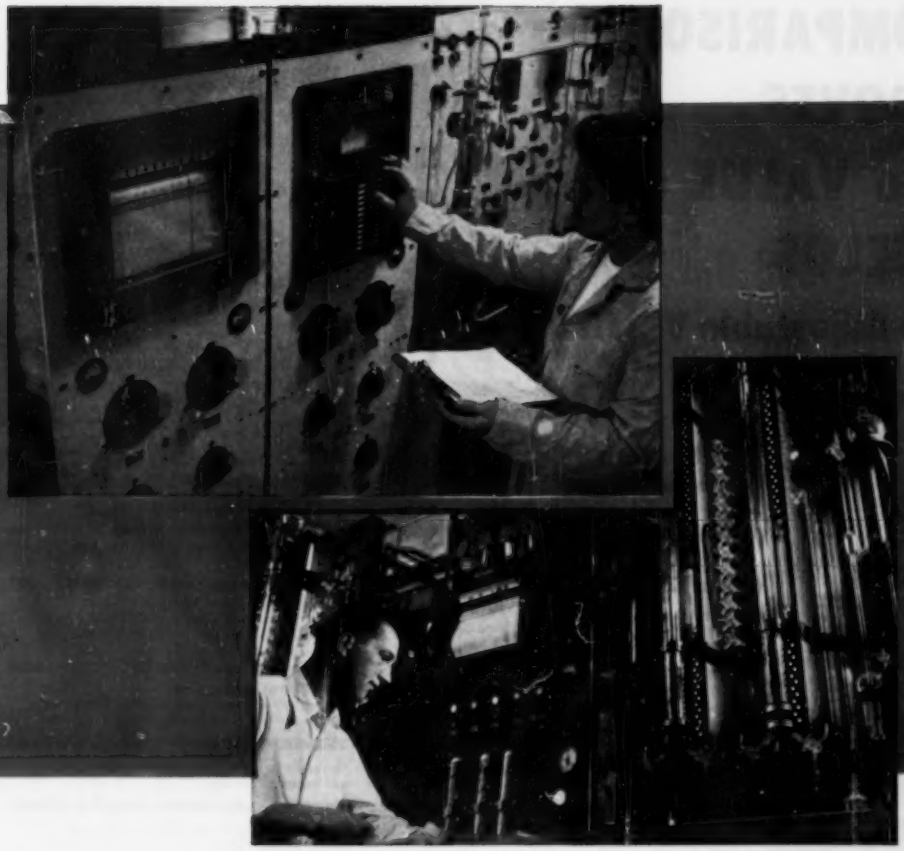
HOMESTEAD VALVE MANUFACTURING COMPANY

PO Box 13

Serving since 1882

CORAOPOLIS, PA.


PILOT PLANT
On the threshold of process perfection...
BROWN Instrumentation
. . . is patterned to the exact requirements of individual plants and processes . . . is the result of engineering and application know-how, with one responsibility from sensing elements to control valves . . . is backed by a nation-wide field engineering and service organization.



PROVING processes in the pilot plant stage can save untold millions of dollars in "on-stream" operations. But bridging the gap between fluid ounces per hour in the laboratory and hundreds or thousands of barrels per hour in the plant takes considerable doing.

Thorough instrumentation in the pilot plant provides . . . (1) *a saving in scientific man-hours*, through the centralization of critical data which eliminates the hand logging of hundreds or even thousands of points . . . (2) *easy and rapid interpretation of data*, through automatic coordination and recording in chart form . . . and (3) *process simplification*, through a complete understanding of control problems well in advance of full-scale operations.

Add to these advantages the fact that, with instruments, pilot studies are accomplished in much less time . . . for instruments *accelerate* research. Investigate the wide application possibilities of Brown Instrumentation. Our local engineering representative is qualified to discuss your requirements . . . and he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Important Reference Data

WRITE FOR A COPY OF 84-PAGE BULLETIN NO. 15-14, "INSTRUMENTS ACCELERATE RESEARCH"... AND NEW BROCHURE, "TOMORROW IS TODAY."

COMPARISON PROVES the VALUE of VEELOS

the Adjustable V-Belt...

IF you use v-belts you'll be interested in this clear statement of facts about VEELOS, the link v-belt, and endless v-belts.

These 4 reels of Veelos provide up to 316 standard v-belt sizes.

COMPARISON TABLE
VEELOS and ENDLESS V-BELTS

what about...?	Veelos V-Belts	Endless V-Belts
ADJUSTABILITY	*Any* length can be provided for *any* v-belt drive due to link construction.	Standard or special lengths must be supplied for *individual* drives.
INVENTORY	MINIMUM INVENTORY. 4 reels can care for every v-belt need in the O, A, B and C widths. No deterioration or obsolescence of spare belts.	LARGE INVENTORY. 316 sizes are required to provide a *complete* stock in the O, A, B and C widths. Spare belts not immediately used will age and deteriorate.
STORAGE SPACE	SMALL SPACE. It takes less than 2 square feet of wall or floor space to store 4 reels of easily identified Veelos.	LARGE SPACE. Walls and ceilings are often covered with stocks of endless v-belts. Identifying and maintaining full stocks is difficult and costly.
INSTALLATION	Installs quickly *on any drive* without resetting motor or tearing down outboard bearings.	Necessary to reset motor and tear down drives with outboard bearings.
MAINTENANCE	Belts can be adjusted or replaced without moving the motor.	Sliding or pivoted motor bases are necessary to replace endless v-belts. Belts cannot be adjusted individually.
OPERATING EFFICIENCY	Full power delivery can be maintained because the tension of each belt in a matched set is kept uniform by removing or adding links.	Individual belts cannot be adjusted to maintain uniform tension and provide full power delivery.
DRIVE LAYOUT	No limitations are imposed by belt length.	Limited by the availability of standard or special belt lengths.

If you would like to learn more about Veelos—how it can save you money and keep your machines producing—write today for your copy of the Veelos Data Book. It's free and full of facts!

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PENNSYLVANIA

VEELOS
THE LINK
V-BELT

...ADJUSTABLE TO ANY LENGTH...ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof and static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

make every bit of stainless count

Wise and efficient use of available stainless steel stocks can go a long way to making sure that all defense and industry needs are met.

Getting the best available materials for your job is a vital first step—Crucible, pioneers in the development of stainless steels, urges you to take full advantage of our metallurgical staff and stainless fabricating specialists. Their wealth of experience—based on thousands of stainless applications—can help stretch your stainless supply. There is no other metal that can work the same "miracles" as stainless, and these Crucible metallurgists can help you select the best available stainless grades for your needs.

It's up to you to make every bit of stainless count—we're equipped to help you do it. When your problem is stainless—call on us.

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

STAINLESS STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

Choosing tower packing for efficiency and long life...

With critical shortages imminent in almost every heavy industry, the question of what tower packing material to use warrants the most careful forethought.

To the requirement of optimum performance now must be added *durability* . . . replacements may be hard to make in the years ahead.

The various tower packing forms developed from Nickel, Inconel® and Monel® deserve your special consideration. All three metals possess high strength, wettability, and high resistance to attack by many fluids processed in packed towers.

Metal tower packing offers five basic advantages that serve to increase tower efficiency:

1. **Low weight per unit volume.**
2. **Large surface per unit volume.**
3. **Large percentage of open area.**
4. **Small weight of liquid retained.**
5. **Corrosion resistance.**

If you need help in selecting a satisfactory metal tower packing material, Inco's Technical Service Department will gladly make recommendations. Simply write, outlining your problems.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
NICKEL INCO TRADE MARK ALLOYS

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL • "S"® MONEL
NICKEL • LOW CARBON NICKEL • DURANICKEL®
INCONEL® • INCONEL "X"®

Berl saddle type tower packing, produced in Inco Nickel Alloys and other metals, supplied by Wire Cloth Products, Inc., Chicago, Ill. Packing of this type has given excellent results in pilot towers. It compares favorably in cost with other forms of packing.

★ ★ ★

ABOUT DELIVERIES . . .

Today, Nickel and Nickel Alloys are on "extended delivery" because so much is needed for defense. Although the Government has, in fact, forbidden use of the metals for certain applications, many of their essential uses in your industry are still permitted.

By ordering well in advance of your actual needs, you'll improve your chances of getting delivery for the time the material is needed.

Be sure to include C.M.P. ratings and, where possible, contract numbers for Dept. of Defense orders.

★ ★ ★

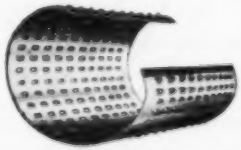
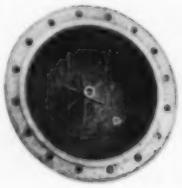


Diagram of protruded packing made by Scientific Development Company, State College, Pa. The individual pieces are small, yet have a large free cross-section. Made in Nickel, Type 316 Stainless Steel, and other metals (on special order).

Heart of a fractional liquid extraction unit comprising a mixing and settling section. The settling section is packed with knit Monel wire mesh. With knit tower packing, open areas from 90% to 98% are obtained, with surface areas up to 200 square feet per cubic foot of packing. Courtesy Otto H. York Co., Inc., East Orange, N. J.



Nearly three tons of Raschig rings, ready for shipment to a large chemical manufacturer. Made of Nickel strip 1½ inches wide by 0.050 inches thick, by the Metallo Gasket Company, New Brunswick, N. J.

"I believe in being honest and telling you

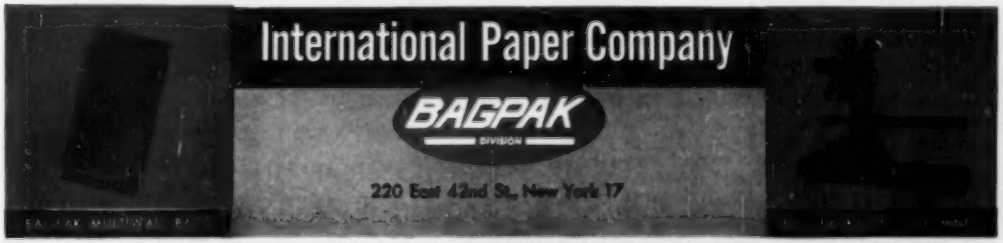
Exactly What I Think About This Bag Closer"

Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

For full details, write today for booklet 280E

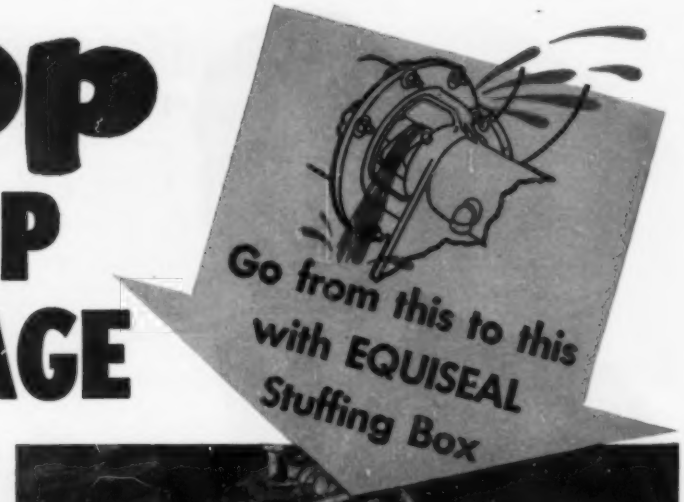
"I bought a Model ET Bagpaker® — the one that applies the 'Cushion Stitch' over a dry tape. It makes a neat, strong, sift-free closure. The machine is of welded steel construction throughout — well built — I don't think it will ever wear out. It takes care of up to 15 bags per minute, and only one man is needed to operate it.

"The thing I like best about the Model ET is that it hasn't given me a bit of trouble — no breakdowns or delays. It purrs right along minding its own business. I'm sold on it."

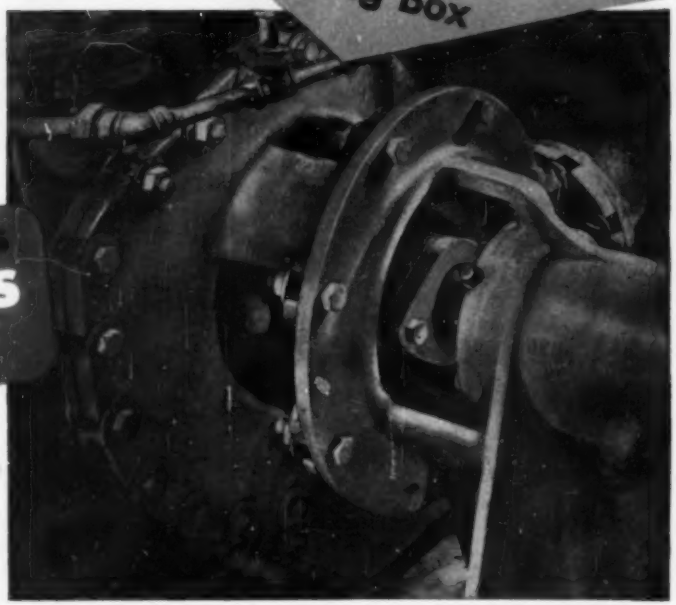


BRANCH OFFICES: Atlanta • Baltimore • Baxter Springs, Kansas • Boston • Chicago • Cleveland • Denver • Los Angeles • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco
IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa, Toronto.

Stop PUMP LEAKAGE



ALLIS-CHALMERS
PROCESS PUMPS



YOU CAN STOP LEAKAGE entirely on suction heads up to fifteen feet with the Allis-Chalmers Process Pump equipped with *Equiseal* stuffing box. This new stuffing box is so effective that the packing may actually be removed while the pump is in operation and no leakage will occur even though there is direct passage from the liquid being pumped to atmosphere. Where suction head is more than fifteen feet, pressure on the packing is reduced by this amount and leakage is greatly reduced.

HOW IT WORKS

An auxiliary impeller develops a low pressure area in front of the packing. The liquid being pumped is thrown away from the stuffing box and back into the main stream. As a result, pressure on the packing is zero up to fifteen feet of suction head and the liquid being pumped does not even enter the stuffing box.

So if you must stop leakage because of sanitation, corrosion, abrasion or for any other reason, call your nearby Allis-Chalmers Authorized Dealer or District Office for application engineering help on your job. Or write Allis-Chalmers, Milwaukee 1, Wisconsin and ask for Bulletin 08B6615. A-3475

Equiseal, Vari-Pitch and Texrope are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sold . . Applied . . Serviced . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

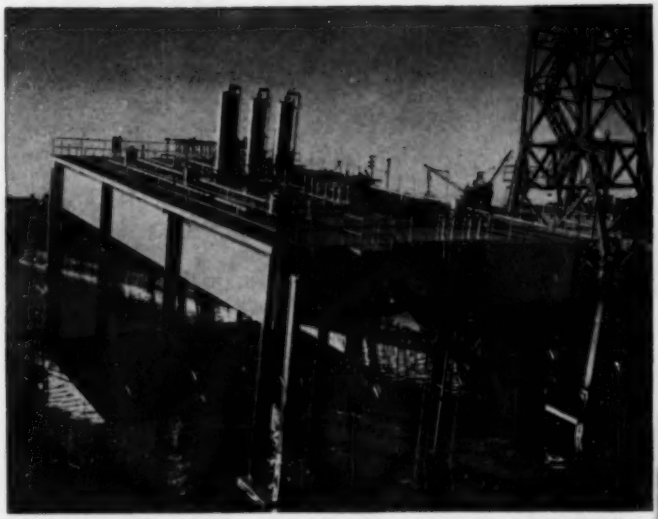
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

First Again

Bethlehem, which developed for the oil industry the *first* integrated submersible drilling barge and the *first* submersible compressor barge, now introduces the *first* submersible oil tank battery barge.



Constructed by Bethlehem's Beaumont Yard, this submersible tank battery barge can store 4,800 bbls of crude in its 72 ft x 48 ft x 8 ft superstructure. Part of the 80 ft x 52 ft x 5 ft float is submerged in this view.

NOW...Bethlehem's Submersible Oil Tank Battery Barge

For the Most Economical and Efficient Interim Storage of Crude in Shallow Water or Marshland

- Storage Capacity to Suit Your Requirements.
- Complete with Pumps, Oil and Gas Separators and Compressors.
- Eliminates Need for Costly Erection Crews Miles from their Base.
- No Piling to Pull or Cut when Moved.
- Mobility, if and when Necessary . . . with 100 per cent Salvage.
- Leakproof . . . Solves Pollution Problem.

Our engineers will be happy to supply further details on request.

SHIP REPAIR YARDS

Boston Harbor	New York Harbor
Baltimore Harbor	Beaumont, Texas
Los Angeles Harbor	San Francisco Harbor

SHIPBUILDING YARDS

Quincy, Mass.	Staten Island, N. Y.
Sparrows Point, Md.	Beaumont, Texas
Terminal Island, Calif.	San Francisco, Calif.

SHIPBUILDERS *SHIP REPAIRERS*

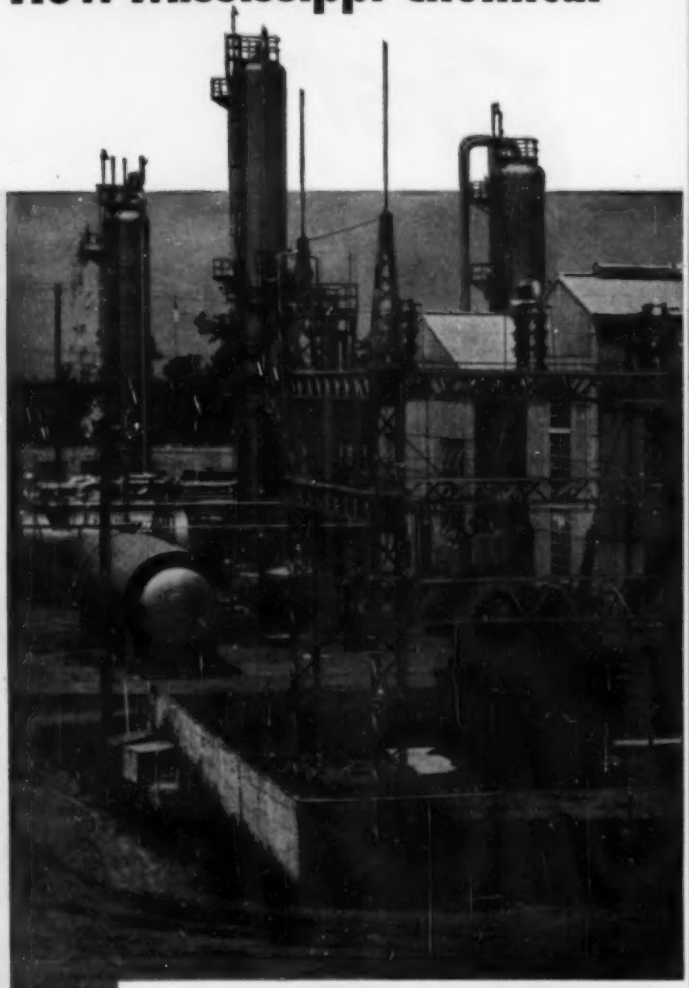
BETHLEHEM STEEL COMPANY

Shipbuilding Division

General Offices: 25 Broadway, New York 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

How Mississippi Chemical



They did

Mississippi Chemical had a series of *over-all* electrical problems when they were planning this plant.

what

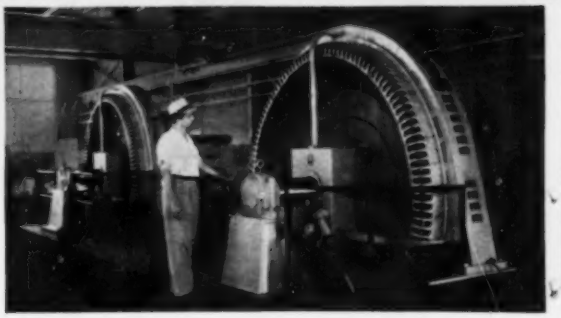
They had Girdler and Westinghouse Engineers *attack these problems as a whole.* Based on previous experience they put together a *co-ordinated electrical system.*

you can do

This experience and this over-all method can be applied to your next project, whatever it is. Westinghouse can work with you on *all* your electrical needs.

to produce more

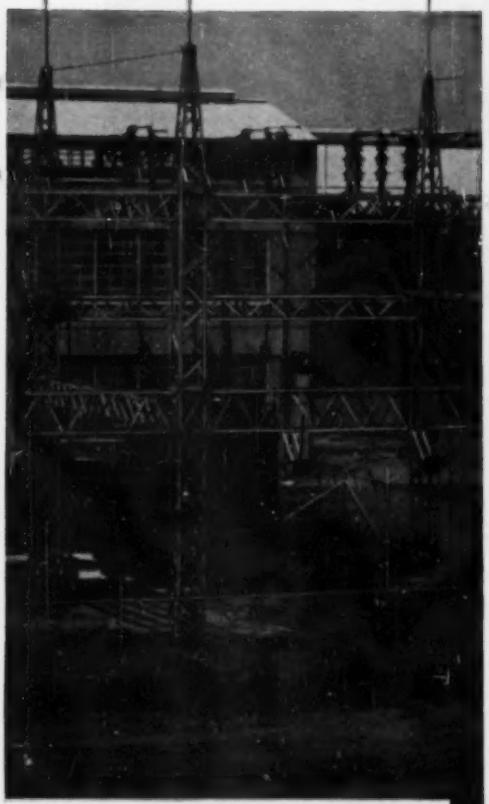
The result will be more dependable production . . . lower costs . . . better operations. Whether you need one motor, or a complex electrical system, call in Westinghouse.



Ammonia Superintendent inspects the 900-hp hyper compressor in the ammonia compressor room. Driving this compressor and all the other drives in the plant are Westinghouse Motors. These motors have a lower installed cost . . . are easier to operate . . . and require less maintenance than other types of drives.

got the BEST power equipment . . .

at no EXTRA cost!



Mississippi Chemical Company recently built a new plant in Yazoo City, Mississippi. For the electrical engineering, Westinghouse and the Girdler Corp., the engineers and prime contractors, put their heads together. By careful planning they developed a power system that uses the best type of modern equipment *but at no extra cost.* They made savings that offset the higher price. Here's how they did it.

Dependable, Low-Cost Power. To make use of the low-cost power available from the Mississippi Power and Light Company, a complete Westinghouse Substation was installed. Included were two 6000/7500-kva transformers. This rating permits line-starting of the large compressor motors and eliminates the need for costly special controls. The best secondary voltage was determined to be 2400/4160Y-volts. This reduces the size of the copper wire . . . keeps line losses at a minimum . . . and can be easily handled by standard transformers.

Top Motor Performance and Protection. For the main compressor drive, they chose electric motors because they have a lower installed cost . . . are easier to operate . . . and require less maintenance than other drives. The motor control centers were installed throughout the plant in non-hazardous locations. They got the advantage of grouped control without using more expensive, explosion-proof equipment.

Emergency Power Assured. For insurance purposes, an immediate source of stand-by power was required. Neither a combustion engine nor a condensing turbine met the requirements of fast, easy operation. However, a Westinghouse Type E turbine did the trick. It could be started by one man . . . reach full operation in 20 seconds . . . and it costs 25 percent less than any other adequate unit.

Westinghouse Can Help You. The next time you plan to build or expand your plant, call in Westinghouse. You can get these same benefits . . . the results of accurate system planning and dependable Westinghouse equipment. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94902

Shown here is a Westinghouse Power and Control Center which supplies the power for the motors in the ammonia plant. These power and control centers are installed throughout the plant in nonhazardous locations to take advantage of grouped control.

YOU CAN BE SURE . . . IF IT'S

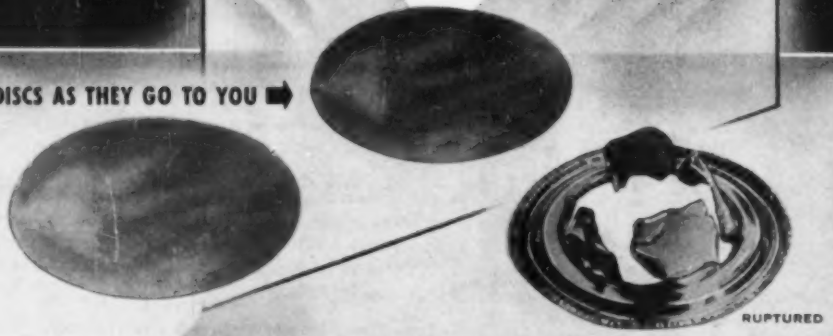
Westinghouse

ELECTRICAL EQUIPMENT
FOR THE CHEMICAL INDUSTRY

Relieve That Excess Pressure *Automatically —Instantly* With

Baker Rupture Discs

THE DISCS AS THEY GO TO YOU



RUPTURED

Sometimes, in emergencies, the standard relief valve operates too slowly or fails altogether from clogging or damage by corrosion.

Our Rupture Discs are sure — act instantly — because they are without the disadvantages imposed by small passages or moving parts.

We make them of precious metals and, for certain applications, of base metals with a protective coating of platinum, gold or silver on one or both sides. They are immune to corrosion and are designed to fit the conditions under which they must operate.

The production of refined noble metals for Rupture Discs, and the discs made from them, are specialties of ours. There is a wide range of sizes guaranteed to blow at pressures of a few pounds or many thousands. **Quick deliveries can usually be made.**

By sending for our booklet with detailed descriptions you may be taking a step to save yourself a costly shut-down.

Baker & Co., Inc.

113 Astor Street, Newark 5, New Jersey

New York San Francisco Chicago

we'll do the job with 3 sq. ft.

OF HEATING SURFACE PER B.H.P.

and we can prove it!

DISTRIBUTORS

Air Conditioning Engineers, Inc.
Mobile, Alabama
Wm. Barrington & Son, Inc.
Cleveland 3, Ohio
Wm. Barrington & Son, Inc.
Phoenix, Arizona
The Bingham & Risdon Company
Green Bay, Wisconsin
Carl A. Berard
Lake Placid, New York
R. J. Clark Equipment Co.
Clearwater, Florida
Crawford Power Equipment Company
Cincinnati, Ohio
Delavan Engineering Company
Des Moines, Iowa
Davenport, Iowa
Dempster Brothers, Inc.
Knoxville 17, Tennessee
Flagg, Brackett & Durgin, Inc.
Boston, Mass.
General Automatic Corporation
Baltimore, Maryland
General Industrial Supply Corp.
Fort Worth 1, Texas
Mr. J. Clifford Hannah, Jr.
Pittsburgh, Pa.
Howell Engineers
Houston, Texas
Hungerford, Inc.
Richmond, Virginia
The Iron Fireman Sales Corp.
Washington, D. C.
Royster H. Johnson Company
Charlotte 1, North Carolina
Kleco Boiler Engineering Company
St. Louis 10, Missouri
Mr. C. O. Bergland
San Francisco, Calif.
Phillips Engineering Company
Detroit, Michigan
Rumbold and Company Inc.
Atlanta 3, Ga.
John L. Shank Heating Equipment
Indianapolis, Indiana
The Shaw Kendall Engineering Company
Toledo 3, Ohio
Technical Service Company
Albuquerque, New Mexico
Temperature Equipment Corporation
Chicago 31, Illinois
F. Thompson Tool and Supply Company
New Orleans, Louisiana
David Thomson Associates, Inc.
Haverford, Pa.
Valeson Engineering Company
Portland, Oregon
Michal-Herman
Buffalo 13, N. Y.
Pittsburgh Water Heater Sales Co., Inc.
Los Angeles, Calif.

EXPORT

Drake American Corporation
New York, New York

with CYCLONIC COMBUSTION

WE REPEAT! Through the principle of *patented* CYCLONIC COMBUSTION, CYCLOTHERM packaged steam generators will produce maximum heat transfer on *any* job . . . *any* application . . . with only 3 square feet of heating surface per B.H.P. That is not an advertising claim—we are stating a fact— *backed by our unconditional guarantee!*

This remarkable performance is based on a revolutionary advance in the principles of heat transfer. In the Cyclotherm unit, the air enters the combustion chamber at a high velocity, and mixing with the fuel is made to *spiral in a revolving vortex* along the entire length of the furnace. This controlled spiral is actually cyclonic in motion. This intensely luminous flame transfers heat to the fire tube both by radiation and convection, resulting in an unusually high rate of heat transfer. *There are no hot spots!* The efficiency of the Cyclotherm principle plus the ingenuity of Cyclotherm design calls for 3 square feet of heating surface per B.H.P. required—*and no more!*

The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of UNDERWRITERS LABORATORIES, INC.

Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Great fuel operational savings.

Boilers are designed for oil or gas operations from 18 thru 500 h.p., 15 to 200 lbs. operating pressure.

Details of these and many other facts regarding Cyclotherm generators are available by writing Dept. E.

MORE POWER per operating dollar

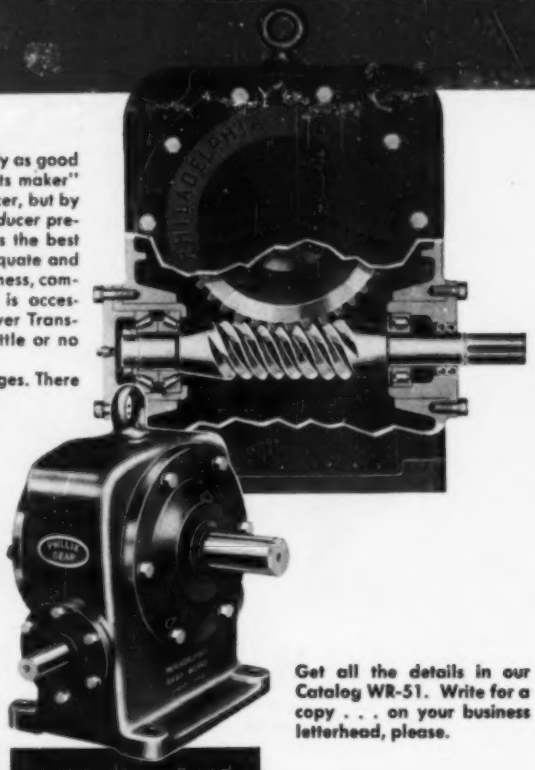
SEE OUR CATALOG IN SWEET'S FILE

CYCLOTHERM
STEAM GENERATORS
OSWEGO, NEW YORK

There's *far more* to a SPEED REDUCER than GEARS

It has frequently been said that: "any Reducer is only as good as the *experience and manufacturing facilities* of its maker" . . . *Gears are vitally important* in any Speed Reducer, but by themselves, they are *just Gears. A good Speed Reducer* presupposes also that it is properly engineered; it has the best anti-friction Bearings; the lubrication system is adequate and highly efficient; the Housing is designed for ruggedness, compactness and proper heat dissipation. The Unit is accessible—and it will deliver a high efficiency of Power Transmission over a long period of service life, with little or no attention.

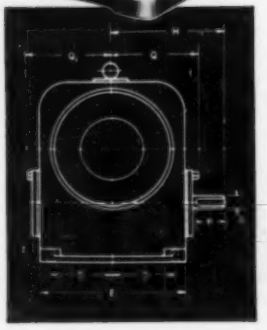
Philadelphia Reducers offer all of these advantages. There is a type and size of Philadelphia Worm Reducer for every industrial requirement.



FEATURES . . .

OF THE TYPE A-T-O AND R-T-O PHILADELPHIA WORM GEAR SPEED REDUCERS

- Units are available with Worm "above" or "below" the Worm Gear, or in Vertical Units.
- Worms are made of alloy steel with carburized, hardened and tempered threads—both shaft and threads are accurately and smoothly ground after heat-treatment.
- Worm Gears are of highest quality chill cast nickel-bronze.
- Bearings are anti-friction types (ball or roller) best suited for smooth, quiet, trouble-free operation (see cut-away illustration).
- Housings are quality grey iron—compact, neat, rigid and of ample radiating surface to prevent overheating.
- All units carry A.G.M.A. rating.
- Easy accessibility for removal of either Worm or Worm Wheel assemblies, from the housing.
- Lubrication by splash system to all moving parts, in oil-tight housing.
- Efficiencies as high as 96%.



Get all the details in our Catalog WR-51. Write for a copy . . . on your business letterhead, please.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

FOR THOSE EXTREMELY CORROSIVE CONDITIONS...

CONSIDER THE USE OF *Amer-Plate*

Available in Two Convenient Types To Meet Your Needs

Plain AMER-PLATE for existing steel or concrete tanks or structures

Plain Amer-Plate is smooth and flat on both sides. It is applied to existing surfaces using specially developed cements that provide a firm bond with those surfaces.

T-LOCK AMER-PLATE for newly cast concrete pipe and structures

T-shaped parallel "anchors" are an integral part and extend along the back of each Amer-Plate sheet. The sheet is applied to the inner forms of tanks, concrete pipe, and structures. When the concrete is poured, the tees are embedded and locked into the concrete.

HERE'S A NEW, EXTRA-TOUGH, ECONOMICAL INDUSTRIAL SHEET LINING

Especially designed to protect against extremely corrosive conditions, Amer-Plate is particularly adaptable for use in highly corrosive sewers, chemical storage tanks, tank cars and tank trucks hauling unusually corrosive solutions.

Composed of inert resins and plasticizers, Amer-Plate is impervious to gases, highly resistant to acids, alkalies, alcohol, oils, salts, and petroleum products. It has a very low moisture vapor transmission rate, will not support combustion, and contains no toxic materials.

Amer-Plate is a flexible thermoplastic sheet, practical for application to flat, curved and angular surfaces. Its economy and effectiveness has been proved in the field in over 10 years of development and testing.

So... wherever you require long lasting protection against extreme corrosion, make a full investigation of the possibility of using Amer-Plate. Write for complete information.

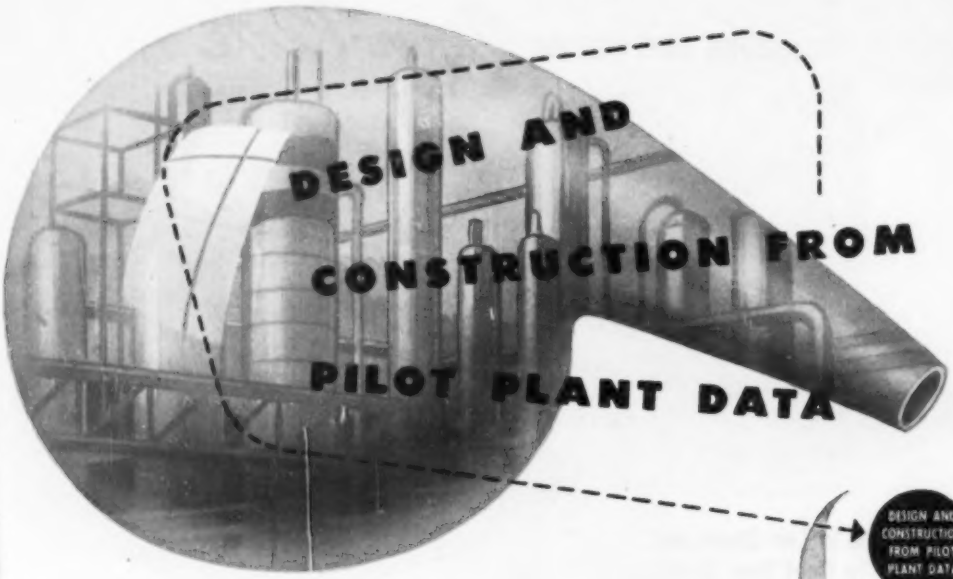
Amer-Plate industrial sheet lining is the result of many years experience in the manufacture and application of Amercoat protective coatings.

AMERCOAT CORPORATION

A division of American Pipe and Construction Co.

4809 Firestone Blvd., South Gate, California

TYPICAL WIGTON-ABBOTT SERVICE IN THE PROCESS ENGINEERING FIELD



From information gained during experimental work with the pilot plant, Wigton-Abbott engineers analyze the data, suggest any additional tests that may be necessary, develop the process and prepare engineering flow sheets. This is one phase of the 5-point service to the chemical industry offered by the Wigton-Abbott Corporation. It is the key to an integrated plan for the design and construction of a complete plant—a service available separately or as part of an overall project. Let us discuss your plant construction problem with you and show you how Wigton-Abbott can help you every step of the way.

5 WIGTON-ABBOTT SERVICES TO THE CHEMICAL INDUSTRY

- DESIGN AND CONSTRUCTION FROM PILOT PLANT DATA
- PROCESS DESIGN FROM CLIENT'S FLOW SHEET
- ECONOMIC SURVEYS AND ANALYSES
- THE DEVELOPMENT OF A NEW PROCESS
- CONVERSION OF EXISTING FACILITIES

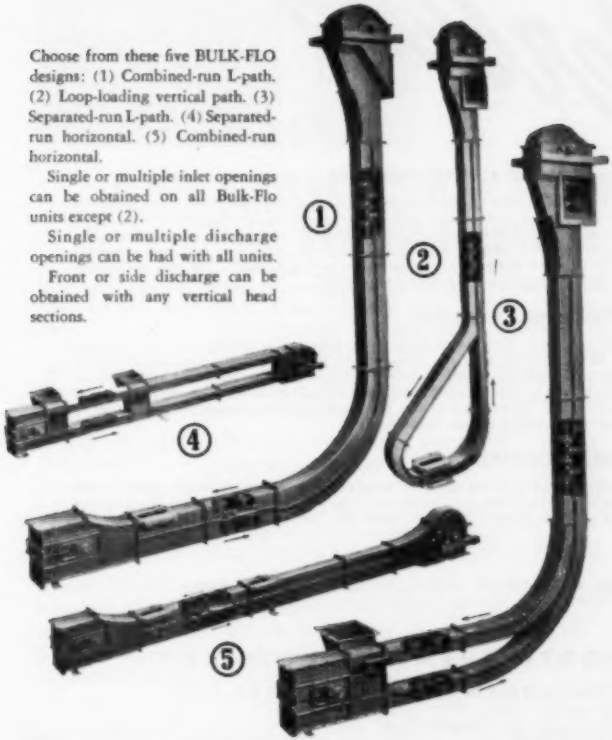
● *Yours for the asking* "Packaged Plant Construction". Reading time, only 10 minutes—but it will save you many hours by answering basic questions.

Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY

Combined feeder · conveyor · elevator cuts your handling costs

LINK-BELT BULK-FLO provides positive, gentle movement of material either full or partially loaded



Choose from these five BULK-FLO designs: (1) Combined-run L-path. (2) Loop-loading vertical path. (3) Separated-run L-path. (4) Separated-run horizontal. (5) Combined-run horizontal.

Single or multiple inlet openings can be obtained on all Bulk-Flo units except (2).

Single or multiple discharge openings can be had with all units.

Front or side discharge can be obtained with any vertical head sections.

BULK-FLO gives you true versatility in bulk materials handling . . . at lower cost. It replaces several units in less space . . . cuts initial outlay. And because *solid flights* operate independently of internal pressure, BULK-FLO can be operated at less than full capacity, with positive movement of materials.

That means capacity can be varied by regulating the feed. It also means gentler handling —material is protected in individual "compartments" to minimize degradation.

And note this—regardless of the amount of material being fed, BULK-FLO is self-clearing through intermediate runs. This feature allows you to alternate batches of different materials and prevents contamination.

You can get complete information on BULK-FLO from the Link-Belt office near you. Or write for your copy of Book 2175.

LINK-BELT

BULK-FLO
FEEDERS · CONVEYORS · ELEVATORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 13,002

how to "liquidate" alien ions....

VERSENE ELIMINATES METALLIC CONTAMINATION

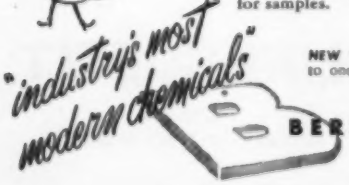
Foreign metallic ions are all enemies of industrial processing and products. They promote decomposition, rancidity, odor, coloration and cause many other undesirable reactions. Versene destroys these troublemakers by neutralizing them efficiently and economically. It does so by reacting with most metallic ions to form soluble non-ionic chelate compounds of such great strength that the alien ions are completely "liquidated", and can no longer interfere with the quality of your products and processes.

VERSENE OFFERS EXCEPTIONAL STABILITY

Completely stable in solution, Versene does not decompose in either acid or alkaline solution, or at high temperatures. It is stable and inert against attack from any chemical compound except strong oxidizing agents such as permanganate and acid dichromate. Available in dry or liquid form, the Versenes are the tetra sodium salts of Ethylene Diamine Tetra Acetic Acid and other polyamino acids. They are the most versatile and the most powerful complexing (chelating) agents known.

VERSENES—FOR QUALITY CONTROL

When your processes and products are upset by those troublemakers — *foreign metallic ions* — at least one of the seven Versenes can probably help you "liquidate" them. Call on the Versenes for *quality control.* Write Dept. B. Send for Technical Bulletin No. 2. Ask for samples.



NEW VERSENE WATER TEST KIT. Tells total hardness in 2 minutes. Accurate to one grain per gallon. Versenate Method. Complete Kit $5. postpaid.

* Trade Mark

BERSWORTH CHEMICAL COMPANY

FRAMINGHAM, MASSACHUSETTS

Warehouse Stocks

Providence Agent: George Mann, 251 Fox Point Boulevard, Providence, Rhode Island

Midwest Agent: Kraft Chemical Co., Inc., 917 W. 18th St., Chicago

Wasatch Chemical Co., Salt Lake City, Utah

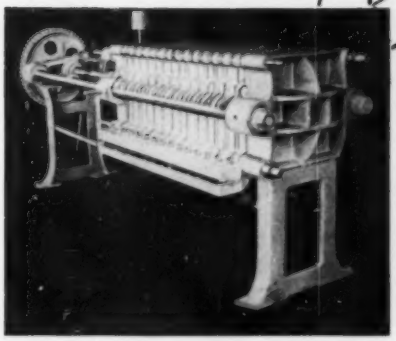
W. Coast Agent: Griffin Chemical Co., San Francisco, Los Angeles

Borada & Page, Inc., Dallas and Houston, Texas

Associated Chemical Co. of Canada, 14 Darrell Ave., Toronto, Ontario

Chas. S. Tanner Co., 1815 Liberty Life Bldg., Charlotte, North Carolina

it's a tradition



AND QUALITY IS A TRADITION WITH THE SPERRY FILTER PRESS!

Sperry has pioneered and developed the Filter press that today ranks as America's most widely used filter. This definite acceptance of Sperry engineering reflects the *tradition of quality* that for over a half century has set the standard for all Sperry equipment . . . as exemplified in these advantages of the Sperry Filter Press:

Greater Flexibility: Handles any kind of filterable mixture . . . requires less floor space . . . operates on low, medium or high pressure . . . can handle hot liquids without vaporizing . . . Uses filter paper or pulp, wire, wool, asbestos, glass, vinyon and other kinds of simple filter cloths.

Greater Performance: Produces maximum clarity . . . makes the driest cakes . . . can separate emulsions . . . delivers filtrate to higher level than filter . . . leak proof construction . . . can deliver cake in slab form . . . thoroughly washes the cake.

Greater Economy: Low first cost . . . low upkeep . . . low installation cost . . . low depreciation . . . long life.

For specific data regarding your own filtration problem, consult Sperry. Send samples of your material for test run.

SPERRY FILTER BASES

All types . . . all sizes. Plain or punched to your specifications. Besides cotton and paper, bases are furnished in wool, synthetics, glass and woven metals.

D. R. SPERRY & COMPANY
BATAVIA, ILLINOIS

Filtration Engineers for over 60 years

Eastern Sales Representative: H. E. Jacoby, M.E.
205 E. 42nd St., New York 17, N. Y.; Phone MUrray Hill 4-3581

Western Sales Representative: B. M. Pilhashy
833 Merchants Exchange Bldg., San Francisco 4, Calif.
Phone DO 2-0375

SPERRY FILTER PRESSES

YOUR HELP IS NEEDED

to get in the

DORMANT SCRAP

At current steel production rates, 50% MORE SCRAP is needed than in the peak year of World War II. The shortage is so real that steel company representatives are calling on every company in the country to find ways of relieving the situation.

Here's How YOU can help

1. Take a fresh look at your own plant scrap and salvage activities.
2. Call in your dealer—sell your scrap—*NOW!*

WSO 3006

Contributed in the National Interest by

ALLEGHENY LUDLUM STEEL CORPORATION

Henry W. Oliver Building · Pittsburgh 22, Penna.

Rohm & Haas has used Tri-Sure Closures for 15 years

Rohm & Haas Company—one of the leading manufacturers of plastics, synthetic resins and chemicals—has used Tri-Sure* Closures since 1936. Year after year, their products are shipped all over the world—in drums that *deliver* the same high quality that leaves Rohm & Haas plants.

If you ship your product in drums, *protect* it with the closures that have *proved* their dependability—in shipment after shipment, by company after company—as the *sure safeguard* against leakage and losses.

Tri-Sure Closures guard every gallon with a *flange* that is as strong as the drum itself . . . a mated *plug* that screws securely into the flange . . . and a heavy-gauge *seal* that is positively leak-proof and tamper-proof.

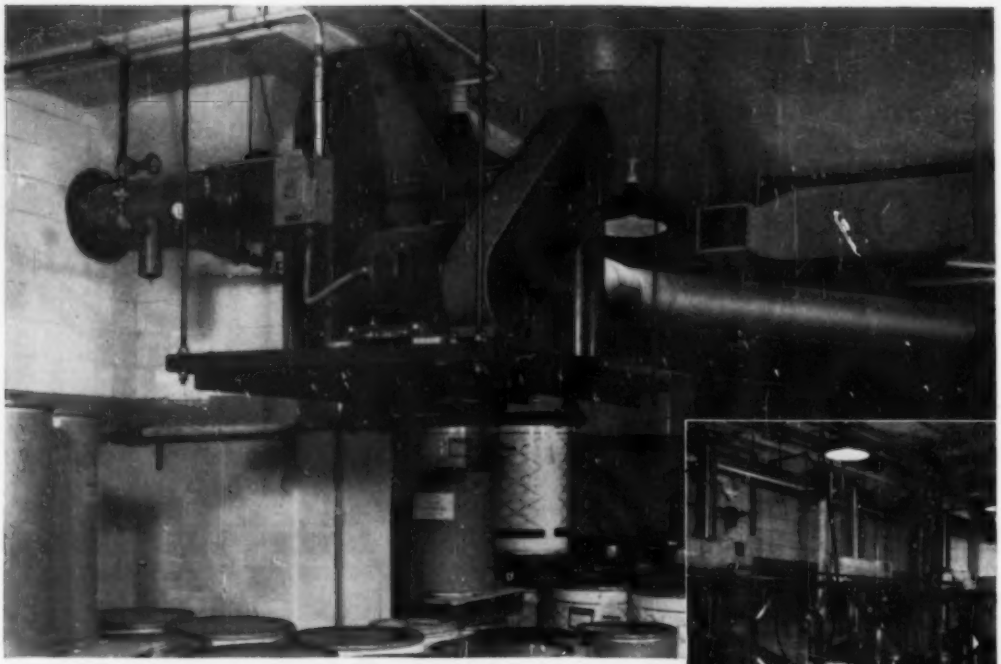
Give this protection to *every* shipment, by specifying "Tri-Sure Closures" on every drum order.

Tri-Sure
CLOSURES

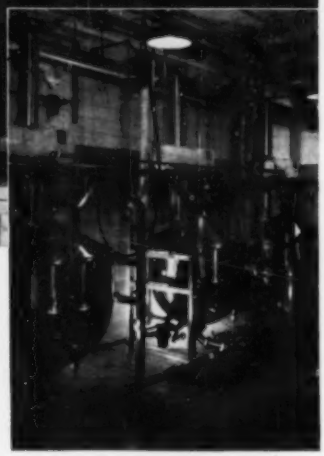
*The "Tri-Sure" Trademark is a mark of reliability backed by 29 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Tri-Sure Products Limited, St. Catharines, Ontario, Canada



Type W ROTO-CLONE Arrangement A—Exhausting processing kettles on other side of end wall. Overhead mounting conserves space.



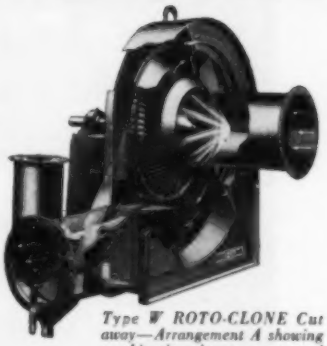
ROTO-CLONE solves fume problem for food processor

Fumes . . . from volatile ingredients are frequently a nuisance in high temperature food processing, as they are in chemical processes. AAF ROTO-CLONES, however, have solved many fume problems for both industries.

The Type W ROTO-CLONE shown above eliminates concentrated vinegar fumes from an exhaust system serving processing kettles of a nationally known food company. It eliminates the fumes so completely, that there is no indication of odors within the air conditioned spaces of the plant, despite the close proximity of the exhaust system discharge to the air conditioning fresh air intake.

This No. 12 Type W ROTO-CLONE Arrangement A has an air volume of 3,000 cfm. It's space saving installation is typical of the many types and sizes of ROTO-CLONES that are widely used to meet air cleaning problems in the chemical industry.

When you need *clean air* call your nearby AAF representative or write direct to us.



Type W ROTO-CLONE Cut away—Arrangement A showing combination of water sprays and dynamic precipitation.

American Air Filter
COMPANY, INC.

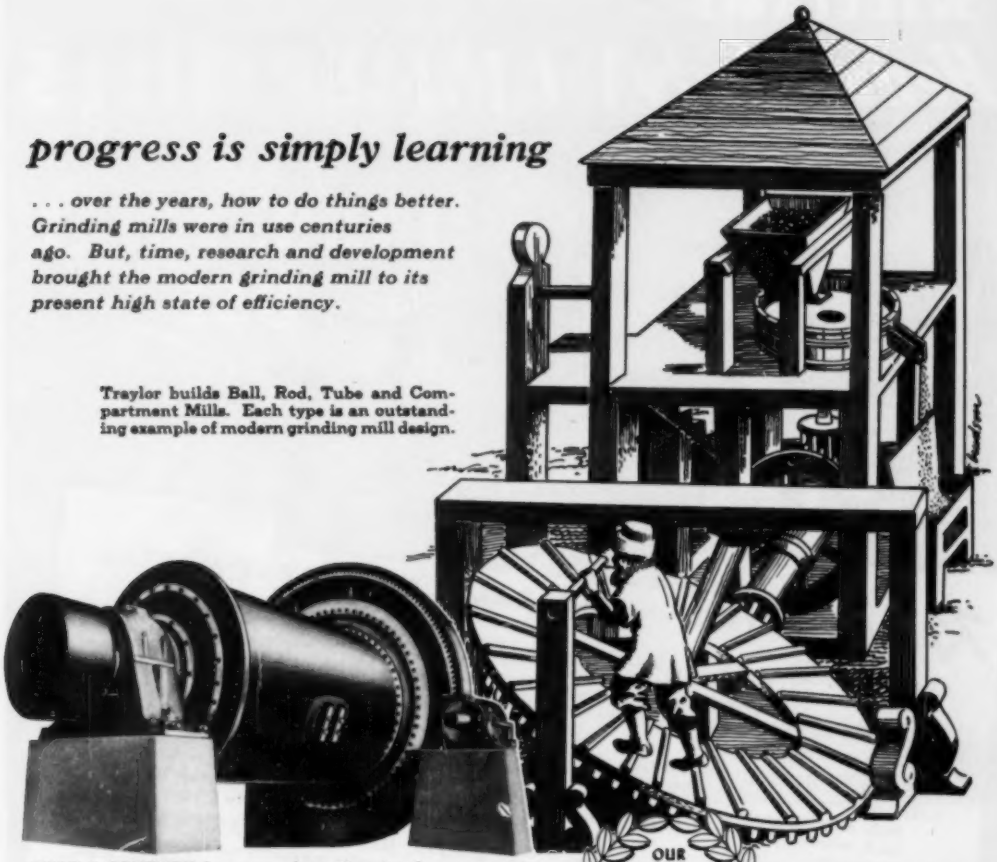
326 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

progress is simply learning

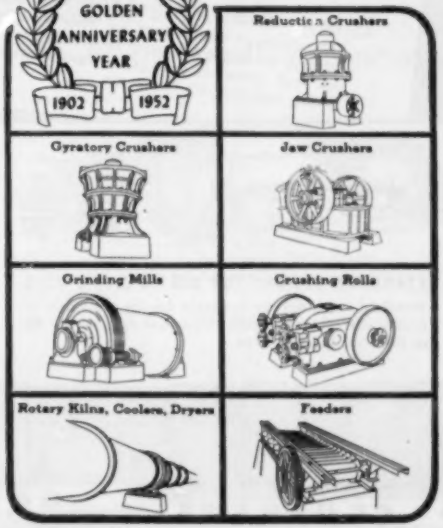
. . . over the years, how to do things better. Grinding mills were in use centuries ago. But, time, research and development brought the modern grinding mill to its present high state of efficiency.

Traylor builds Ball, Rod, Tube and Compartment Mills. Each type is an outstanding example of modern grinding mill design.



HALF A CENTURY has gone into the development and perfection of Traylor Grinding Mills . . . 50 years of experience covering countless grinding problems and processes. Processes and methods change radically over the years. As new problems arise only experience can provide a positive answer before large investments in equipment are made. Leading producers from all over the world depend on Traylor for the solution to their grinding problems. There's no substitute for experience. Traylor has experience . . . over half a century of it.

OUR GOLDEN ANNIVERSARY YEAR 1902 1952



Traylor

ENGINEERING & MANUFACTURING CO.

401 MILL ST., ALLENTOWN, PA.

Sales Offices: New York • Chicago • Los Angeles
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

A TRAYLOR LEADS TO GREATER PROFITS

WILLIAMS
Heavy Duty HAMMERMILLS for INDUSTRIAL USE

Reduce ANIMAL • MINERAL • VEGETABLE MATTER

CHEMICALS, SOAP CHIPS, ETC.
Many dry chemicals are being ground with Williams Heavy Duty Hammermills. Capacity is unusually high and power involved and maintenance extremely low.

OIL CAKE (INCLUDING SOYA), COPRA AND COTTONSEED
Such material, easily ground for use as animal food, whether it is expeller cake or hydraulic press cake.

ANIMAL AND FISH BY-PRODUCTS
Hundreds of installations are daily proving our claims for better and more satisfactory reduction of such materials as — cracklings, tankage, fish scrap, raw and dry bones, etc.

GARBAGE, SEWAGE
Many canneries, breweries, and municipalities reduce waste materials for disposal with Williams Heavy Duty Hammermills prior to flushing through the sewers with water.

STEEL, ALUMINUM AND OTHER METAL TURNINGS
Such materials are readily reduced to "hand shovel" size for easier handling. A metal trap catches studs, bolts and other uncrushables.

ROOTS, HERBS, BARK AND CHIPS
Such vegetable substances are successfully shredded prior to commitment to extracting processes. This treatment permits maximum extraction from the material.

STANDARD DESIGNS FOR BIG OR LITTLE JOBS
Standard machines are available for the reduction of practically every material. Capacities range from 50 to 600,000 lbs. per hour.

WILLIAMS ALSO MAKES . . .
Impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

USE OUR FREE TESTING LABORATORY
Submit your grinding problems to Williams. A sample of the material and description of the desired result will set our facilities to work on a solution to your problem. Visits during test runs and technical consultations are invited.

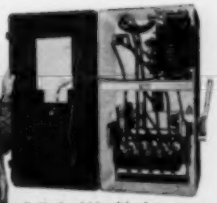
WC-50-1

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 N. Ninth Street **St. Louis 6, Mo.**

WILLIAMS
CRUSHERS **GRINDERS** **SHREDDERS**

OLDEST AND LARGEST MANUFACTURER OF HAMMERMILLS IN THE WORLD

Close-up of chief electrician starting compressor motor. Note, handle is in the "START" position.



Bulletin 646 with door open. Note the air break contacts in this high rating starter.

AIR COMPRESSORS

Worthington air compressors equipped with Allen-Bradley Bulletin 646 Manual Autotransformer Starters installed in Terre Haute Brewing Co., Terre Haute, Ind.

TERRE HAUTE BREWING COMPANY

Equipped throughout with Allen-Bradley Controls

Bulletin 646 Starter installed on motor driving a boiler feed water pump.

Bulletin 746 Automatic Starter for a deep well turbine pump.

The modern Terre Haute Brewing Company, brewers of Champagne Velvet Beer, is equipped throughout with reliable Allen-Bradley controls. This is tribute to the outstanding job being done by Allen-Bradley motor controls in the process industries.

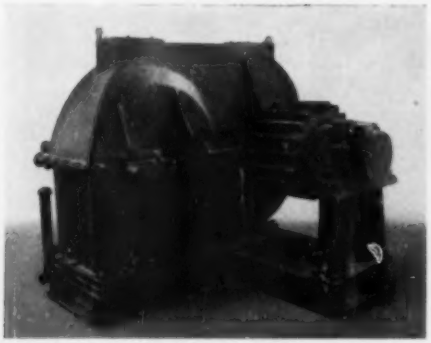
The selection of Allen-Bradley starters is always a wise choice. Their simple design guarantees millions of trouble free operations. Furthermore, their double break, silver alloy contacts require no maintenance. Dependable overload relays are easily reset. Safe enclosures for every kind of job. Write for information.

Allen-Bradley Company, 1337 S. First St., Milwaukee 4, Wis

Beer carbonators operated by slip ring motors controlled by A-B Bulletin 555 Speed Regulator and Bulletin 709 Solenoid Starter.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

Vulcan is equipped to produce cast-steel gear rings, with machine-cut teeth, up to 24 ft. in diameter and 40" face.



Enclosed type of Speed-Reducer Drive Unit now usually provided for Vulcan Kilns. Old-style open-type drive units are still furnished when required for replacement on older kiln installations.

Typical Replacement Tire Section being finished up for shipment from a Vulcan Shop. Tire is one-piece steel casting.

NOW IS THE TIME TO ORDER

REPLACEMENT PARTS

for your Rotary Kilns, Coolers, Dryers, Retorts, Etc.

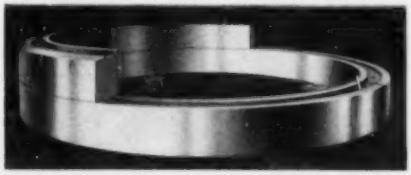
At the present time we can still make reasonably prompt delivery on all of the various types of replacement parts here illustrated and described. No one can foretell the future but why take chances? If you are not already equipped to make quick replacement of all worn or weak parts you have everything to gain and nothing to lose by placing your orders NOW.

There are other good reasons why you should order replacement parts from Vulcan. Fifty years of widely varied experience, backed by a large steel foundry, an equally extensive steel fabricating plant and ample machine shops, especially equipped to handle large work, enable us to give superior service at competitive prices. Estimates submitted promptly on receipt of adequate working data.

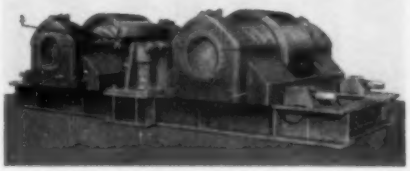
VULCAN IRON WORKS

WILKES-BARRE, PA.

BRANCH OFFICE, 50 CHURCH ST., NEW YORK, N. Y.



Vulcan Sectional Tires are widely used for replacement service and usually permit important savings in installation expense. Available in all sizes, for light or heavy service.



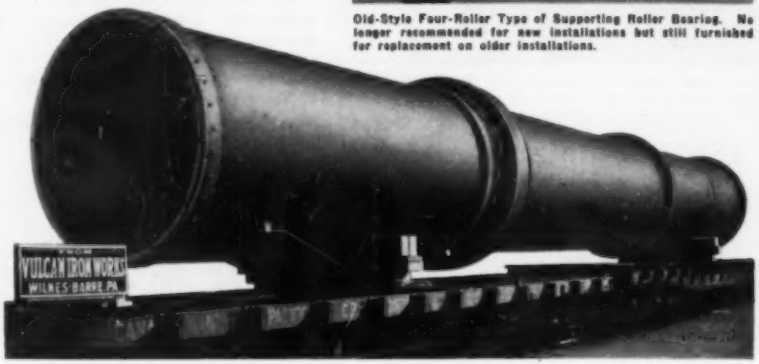
Standard Vulcan Assembly of Supporting Roller Bearings and Thrust Bearings for Rotary Kiln. Other types available for lighter service and also for very heavy service.

Old-Style Four-Roller Type of Supporting Roller Bearing. No longer recommended for new installations but still furnished for replacement on older installations.

Vulcan Welded Kiln-Shell Section ready for shipment. Shells or shell sections can be of any diameter up to the limit of railroad clearances. Unless otherwise specified all longitudinal joints are automatically welded. Intermediate circular joints are usually U-grooved and electrically welded, with suitable outside reinforcements.

Vulcan Shell Sections can be arranged for either field welding to the old sections of the shell or, if preferred, for field riveting to present circular butt straps.

Shell sections can be furnished complete with tires and reinforcements attached to the section.



CHAPMAN

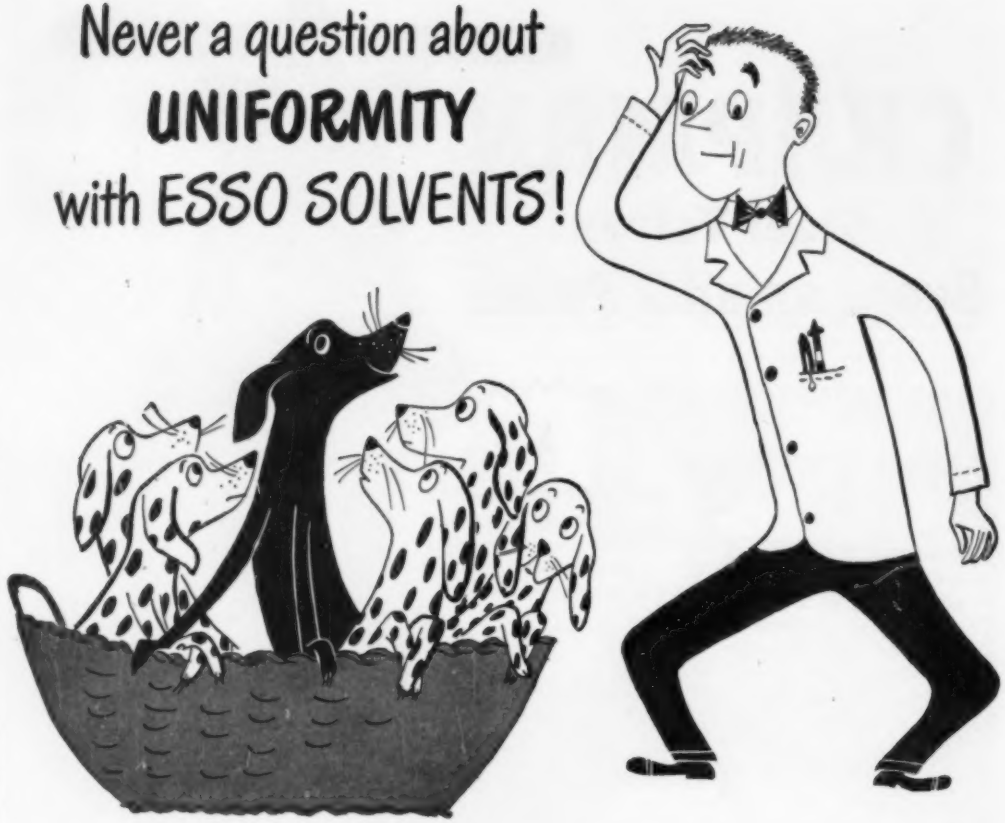
Steel Valves Score on all 3 Points

1
CHAPMAN STEEL VALVES have the high precision ratings of custom-made valves — but the economy of production-line manufacture.
2
CHAPMAN STEEL VALVES are made exclusively from quality-controlled steels developed and produced in Chapman's own foundries under control of Chapman's own outstanding metallurgists.
3
CHAPMAN STEEL VALVES are designed to equal or surpass — A.S.A. and A.P.I. Standards in all pressures and temperature ranges.

Be sure to see Chapman first whenever you need steel valves — gate, globe, angle or check. As a result of Chapman's long years of research and experience, they are tops in every respect.

The Chapman Valve
MANUFACTURING COMPANY
INDIAN ORCHARD, MASS.

Never a question about **UNIFORMITY** with ESSO SOLVENTS!



EXACTING modern refining treatments give Esso Solvents closely controlled uniformity for better processing. Esso Petroleum Solvents are being used more and more in such industries as paint . . . textiles . . . rubber . . . chemicals . . . food packaging . . . leather . . . many others — where uniformity is required.

INDUSTRIAL USERS *know* they can depend on Esso Solvents for purity and uniformity!

YOU CAN DEPEND ON ESSO SOLVENTS FOR

- **UNIFORMITY** — made in modern refineries from carefully selected crude oil sources.
- **ECONOMY** — closely-controlled quality gives constant, efficient industrial processing, high-quality products.
- **CONTROLLED EVAPORATION** — available in a wide range of evaporation rates with precise characteristics to meet your requirements.
- **SOLVENCY** — Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.
- **MODERN HANDLING METHODS** — separate tank storage, pumping lines, tank cars and trucks, are used in all Esso Solvent handling operations. Prompt, efficient delivery to your door is assured.
- **MULTI-STORAGE AVAILABILITY** — Water terminals in industrial centers.

Controlled high quality helps produce larger profits with versatile, dependable Esso Solvents.

Esso PETROLEUM SOLVENTS

SOLD IN Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, West Va. — Charlotte, N. C. — Columbia, S. C. — Memphis, Tenn. — New Orleans, La.

FOR TECHNICAL ASSISTANCE

If you have a solvents problem or want further information on the specifications and characteristics of Esso Solvents — write or call our office nearest you. Our technicians will be glad to assist you.

The 1522 *Challenges Comparison*

...Where else can you find so many efficiency features in one pump!

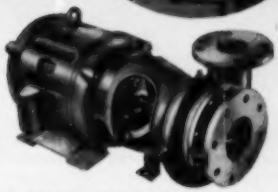
Measure the B & G Series 1522 Pump by any standards you choose . . . you'll say you've never before seen so many warranties of performance in a single unit.

The B & G Leak-proof Seal alone establishes this pump as the "buy" for centrifugal pump applications. The Seal is self-lubricating and eliminates the usual leakage through the packing gland—assures long, trouble-free service.

It's a quiet pump. Long bronze sleeve bearings hold the shaft in alignment and the spring-type flexible coupling helps keep noise at a minimum. The impeller is hydraulically balanced . . . highly efficient.

Bearing bracket sub-assembly, including shaft and sleeve bearings, is interchangeable in all B & G 1522 Pumps. Easily serviced—the pump separates into three parts.

The B & G 1522 is available in all-iron, bronze-fitted, all-bronze or stainless steel units. Capacities to 130 GPM —heads to 115 ft.



B&G Series 1531 Pump
Leak-proof mechanical seal. Capacities to 1200 GPM —heads to 320 ft.

B&G Series 1510-15 Pump
Flexible-coupled. Capacities to 1200 GPM—heads to 320 ft.

BELL & GOSSETT
COMPANY
Dept. CI-14, Morton Grove, Ill.
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

You PAY for a Uniformly Strong Belt You GET IT only when it's BWH ROTOCURED!

(Continuous, uniform cure prevents OCS— weak spots in conventionally-made conveyor belts)*

*Overcured Sections — present every 30' to 40' in all belts made by the flat press method

If belts fail early, don't blame your supplier or your own operating methods. It may be inherent in the *manufacturing process!*

In flat press curing (the conventional method) segments of the belt at 30 to 40 foot intervals are overcured due to press overlaps. They're unavoidable because sections cured previously move forward *less than a full press length.* The result is a series of weakened structures about 2" to 4" wide. These "Achilles Heels" can shorten the life of the best of belts — and *do!*

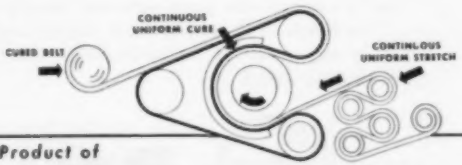
BWH engineers solved this problem with ROTOCURED CONVEYOR BELTS — made by *continuous, constant-motion* curing. You buy a structurally uniform and stronger belt because overlapping is eliminated by the process itself.

Users everywhere who have switched to BWH ROTOCURED BELTS are obtaining:

1 Increased belt flex life (as high as 40%)
2 Elimination of mechanical distortion at the press ends
3 Constant, uniform stretch
4 Uniform, abrasion-resistant covers

Your BWH distributor is abreast of the latest developments in belting. He can show you how ROTOCURE, a great advance, can cut the cost per ton of material conveyed. You'll want to ask him about BWH Transmission Belts also — they permit operation at lower tensions for longer belt life.

DIAGRAMMATIC SKETCH OF EXCLUSIVE ROTOCURE PROCESS



BWH DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P.O. BOX 1071, BOSTON 3, MASS., U. S. A.

Warehouse Stock, 111 N. Canal St., Chicago, Ill.

ARROW
AH
HART

PUSH BUTTON STATIONS

FOR EVERY CIRCUIT NEED

3 COMPLETE LINES

STANDARD DUTY

HEAVY DUTY

OIL TIGHT

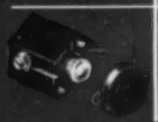
PLUS

The original ARROW-HART feature, INTERCHANGEABLE CONTROL UNITS

PUSH BUTTONS

SELECTOR SWITCHES

PUSH-PULL or PUSH-AND-TURN BUTTONS



PILOTS

BUY WITH CONFIDENCE · PROFIT BY PERFORMANCE

ARROW-HART

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD 6, CONNECTICUT, U.S.A.

ARROW AH HART

EXPLO-SAFE

EXPLOSIONPROOF and WEATHERPROOF MOTOR STARTERS

ALL SIZES

Sizes 0, 1, 2, 3 and 4 for Regular, Multi-Speed and Reversing Motors.

ALL LOCATIONS

NEMA Type VII, Class I, Group D (Explosive Gas and Vapors); NEMA Type IX, Class II, Groups E, F and G (Explosive Dust, Flyings and Fibers); NEMA Type IV, Weatherproof.

ALL APPROVED BY UNDERWRITERS' LABORATORIES

NOT just "conforming to" or "meeting" U.L. Specifications, but

APPROVED

SIZE 2, NEMA Type VII

AND JUST 2/3 THE SIZE AND WEIGHT OF ORDINARY STARTERS PLUS SUPERIOR PERFORMANCE, GREATER DEPENDABILITY.

"EXPLO-SAFE", the explosion and weatherproof version of Arrow-Hart's Type "RA" Starter Line, now brings the advantages of this revolutionary new motor control design to hazardous and exposed locations. Space and weight savings offer new opportunities for compact, control panel design and fast, economical installation. Straight-thru, front wiring means quicker hook-up, easier maintenance.

Inside features for complete arc quenching plus the special, cast Paraloy enclosures — built to resist corrosion and withstand great internal pressures — mean full protection for operator and plant. You'll find that Explo-Safe Type "RA" Motor Starters offer more plus features in less space than any other starter on the market.

ARROW-HART TYPE "RA" MOTOR STARTERS ARE ALSO AVAILABLE IN NEMA TYPE I ENCLOSURES FOR ALL GENERAL SERVICE INDOOR APPLICATIONS.

SEND FOR LITERATURE, COMPLETE WITH RATINGS, DIMENSIONS, WEIGHTS AND ENGINEERING DATA.

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD 6, CONNECTICUT

Please send me free descriptive literature. I'd like to know more about:

- ☐ EXPLO-SAFE STARTERS
- ☐ PUSH BUTTON STATIONS
- ☐ MULTI-SPEED, REVERSING STARTERS
- ☐ TYPE "RA" MOTOR CONTROLS

NAME _____

POSITION _____

CO. NAME _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

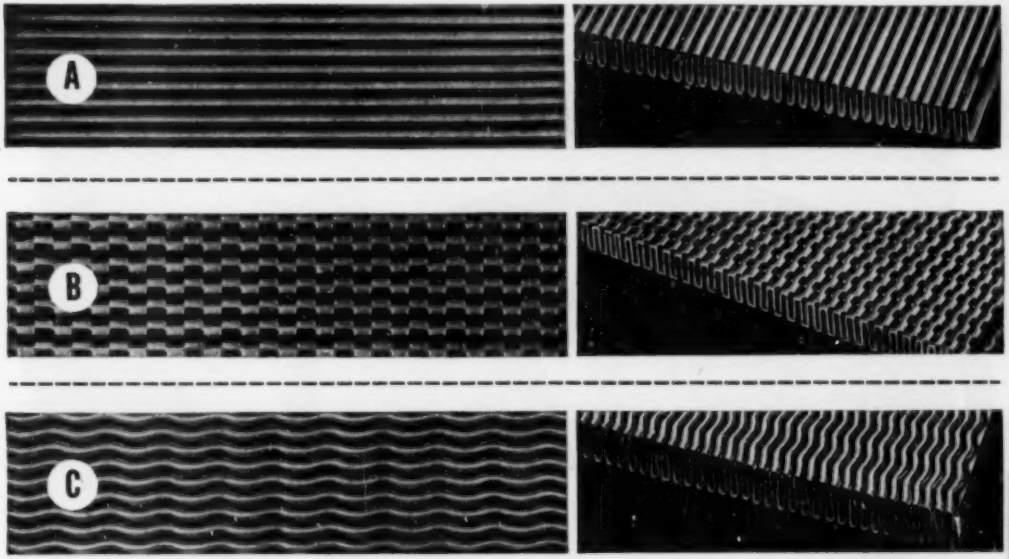
ARROW-HART

INDUSTRIAL CONTROL DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 HAWTHORN STREET, HARTFORD 6, CONNECTICUT, U.S.A.

Branches in: ATLANTA, BOSTON, CHARLOTTE, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DENVER, DETROIT, INDIANAPOLIS, KANSAS CITY, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, SAN FRANCISCO, SEATTLE, SYRACUSE. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO 13, ONTARIO.

Printed in U.S.A.



Three of the many types of fin section available.

TRANE Brazed Aluminum Heat Exchangers Offer Wide Choice of Heat Transfer Surfaces for Greater Design Flexibility

With Trane Brazed Aluminum Heat Exchangers, you choose from a great variety of surfaces in solving exactly your heat transfer problems. They may be straight and continuous (A). They may be serrated (B). Or they can be of herringbone design (C). With these basic designs, exactly the right surface can be selected to provide the correct ratio of heat transfer to pressure drop characteristics.

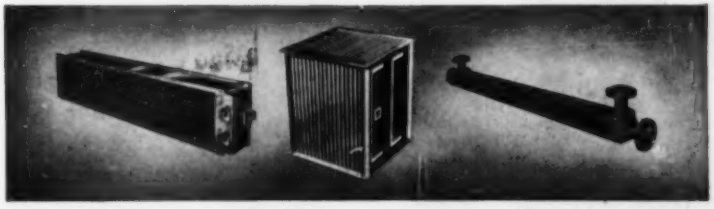
Many further variations of these general types are practical. The height and the thickness of the fin can be varied. So can the number of fins per inch. In fact, fins with entirely different patterns, heights and number of corrugations per inch can be used side-by-side to handle different fluids in the same exchanger.

Thanks to this great flexibility you can provide just the heat transfer, just the pressure drop volume, velocity number and direction of passes you want with Trane Brazed Aluminum Heat Exchangers.

Design flexibility is but one of the many advantages of Trane Brazed Aluminum Heat Exchangers. Compared to conventional exchangers, they produce more heat transfer efficiency in ¼ the space with ⅓ the weight at approximately ½ the cost.

These all-aluminum heat exchangers are rugged, too. They take test pressures up to 1,000 pounds per square inch and temperatures from −300° to 500° F.

Whether the job calls for high or low temperatures or pressures, one stream or many, Trane Brazed Aluminum Heat Exchangers can be the answer. Contact your Trane sales office or write direct.



Here are a few of the many varieties of Trane Brazed Aluminum Heat Exchangers which are now in actual service: 1) A cross flow unit for liquid-to-gas exchange used for condensing purposes. 2) A cross flow gas-to-gas unit which is used for intercooling for aircraft engines. 3) A counter flow liquid-to-liquid exchanger for high pressure application.

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto

OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

Did you know?...

ENJAY

*Trade-Mark

sells an extensive line of oxygenated solvents and chemicals

The famous ENJAY* Oval Trade-Mark stands for a diverse line of high-quality solvents and chemicals. Every day more industries are using ENJAY materials to produce improved products.

EXPERIENCED

RELIABLE

DIVERSIFIED

ENJAY markets this wide range of industrial chemicals:

Petrohol 91 (Isopropyl Alcohol)
Petrohol 95 (Isopropyl Alcohol)
Petrohol 99 (Isopropyl Alcohol)
Secondary Butyl Alcohol
Isooctyl Alcohol
Isopropyl Acetate
Secondary Butyl Acetate
Acetone
Methyl Ethyl Ketone
Ethyl Ether
Isopropyl Ether
Diisobutylene
Polypropylenes
Butadiene
Isoprene
Dicyclopentadiene
Aromatic Tars
Paratone
Parapoid
Paratac
Paranox
Paraflow
Vistanex
Naphthenic Acids

ENJAY products are marketed in bulk or in quantities to fit your requirements.

ENJAY COMPANY, INC.
15 W. 51st St., New York 19, N. Y.

TORTURE CHAMBER

for VALVE and FITTING MATERIALS

Here, steam up to 1500 pounds pressure and 1000° F. gives Vogt the answer to any question of materials or construction for valves and fittings in just a few days . . . facts that would take years to obtain under normal operating conditions!

We set up our own Torture Chamber to determine the durability of valve packings and gaskets; the resistance of various steels to corrosion and erosion; and how hard and how smooth surfaces of seats, discs and stems must be to withstand steam at high pressures and high temperatures. We tested and found an ideal yoke nut material, and we uncovered facts on joint design that could be found in no other way.

Thus, by constant and accelerated testing, we quickly and definitely prove or disprove the claims that are made for many newly developed materials. And thereby we make sure that only the best goes into valves and fittings that bear the name Vogt.

Consult Catalog F-9 for the complete Vogt line of drop forged steel valves, fittings and flanges for steam, water, oil, gas, air and refrigeration services.

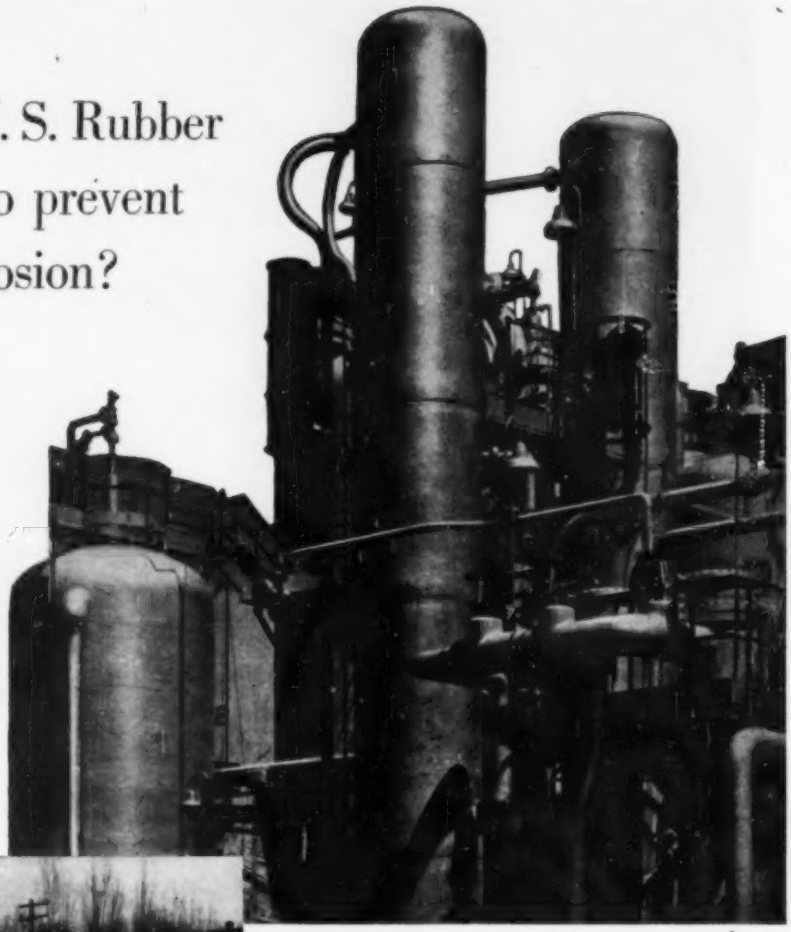
HENRY VOGT MACHINE CO., Louisville 10, Ky.

BRANCH OFFICES: NEW YORK • CHICAGO • CLEVELAND
PHILADELPHIA • ST. LOUIS • DALLAS • CHARLESTON, W. VA.

Vogt

DROP FORGED STEEL VALVES and FITTINGS

What's U. S. Rubber doing to prevent corrosion?



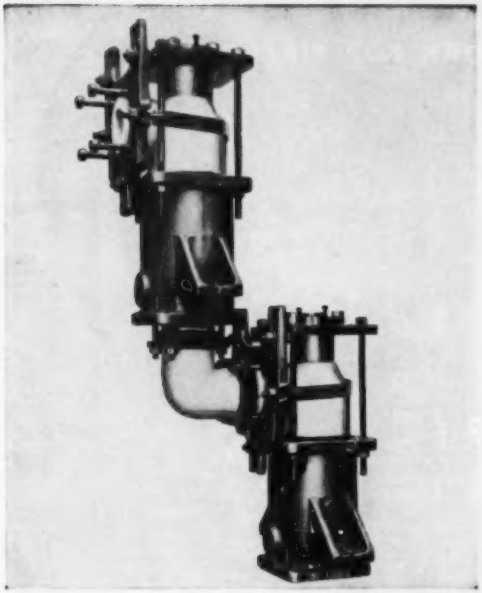
ROYALGUARD PROTECTIVE COATING has excellent resistance to weather. It will not crack or chip. It is ideally suited to protect chemical processing equipment, tanks, tank cars, pipes, fittings, structural steel parts and machinery.

U. S. Royalguard, the new, remarkable protective coating, is a wonderful defense against corrosive attack. Sprayed on surfaces of steel, aluminum, concrete, hardwoods, masonite and transite, it provides effective resistance against a wide range of chemicals. Royalguard reduces maintenance and replacement costs. It has high film flexibility and adhesion qualities, becomes tack free rapidly at room temperatures, has excellent reverse impact resistance, requires no primer. For more information about Royalguard write to address below.

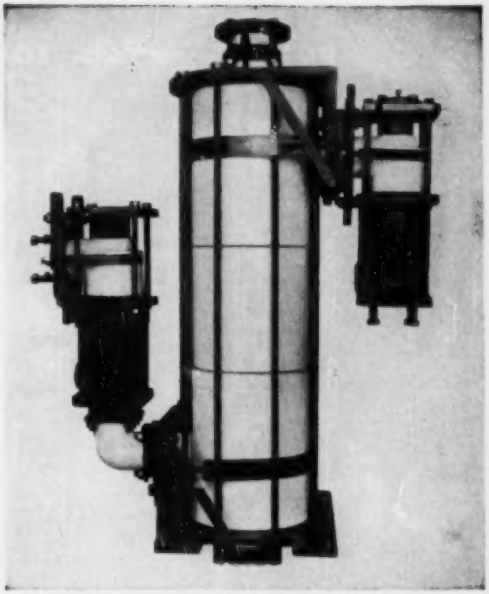
PRODUCT OF U.S.RUBBER

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N.Y.



Worthington two-stage non-condensing ejector—porcelain



Worthington two-stage condensing unit—porcelain

How To Maintain an Uninterrupted Vacuum

in the presence of corrosive vapors

Use a Worthington corrosion-proof steam-jet ejector. These are made in stock sizes and specially engineered for handling any corrosive vapor problem in the chemical field.

For corrosive vapors, these ejectors are made with impervious graphite nozzles and diffusers. Suction chambers are of porcelain, but these can also be furnished of impervious graphite. Porcelain diffusers are also available.

For corrosion-*resistant* usage, Worthington makes ejectors of bronze, stainless steel or Worthite (a special Worthington "super-stainless").

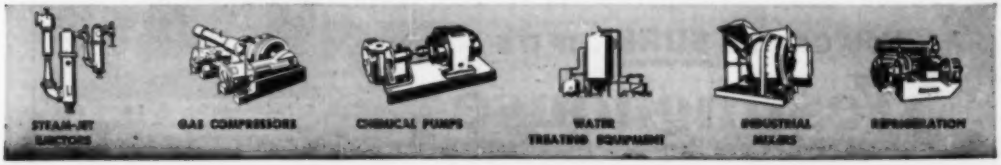
Worthington's is the *most complete* ejector line. A model for every vacuum requirement —from atmospheric to 50 microns absolute. Single and multiple stages. Condensing and non-condensing.

Put your problem—distillation, drying or any other vacuum problem—up to Worthington Pump and Machinery Corporation, Steam Power Division, Ejector Section, Harrison, New Jersey.

WORTHINGTON

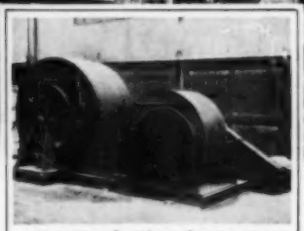
STEAM POWER DIVISION

X1.2



PUTTING *Air* TO WORK FOR FIBERGLAS

Without an infallible air supply at many process stages, Owens-Corning could not make their famous Fiberglas.



Sturtevant fans keep furnace exteriors cool, prevent refractory brick from disintegrating.

Tiny fibers of glass are formed into Fiberglas mat by air, put to work with Sturtevant fans.

Heavy-duty fans drive air at high temperatures through Fiberglas mat to cure bonding agent.

FAN THE FIRE
TO MAKE A MILLION MARBLES

These machines swallow glass at 2200°F, spit out 320 red-hot marbles a minute. In one day, they produce more than a million marbles to feed forming machines turning out a multitude of famous Fiberglas products.

Air plays a vital role in many ways in glass making. Take, for example, the combustion air to the glass furnace. If it failed for only a short time, the entire melt would be lost and it would require a week to rebuild the furnace. And throughout this huge plant, over 150 Sturtevant fans like those pictured at right give production an assist by *putting air to work* in both cooling and heating processes.

Our specialty is making air work for you . . . with a complete line of air handling, air conditioning and air cleaning apparatus. For help on your problem, call your local Westinghouse-Sturtevant office, or write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80242

Can Processors Get Stainless Steel Piping Now?

YES **THEY CAN,** in spite of shortages and slow deliveries on many stainless materials.

For verification, see the picture at the right—a carload of *ESCO* stainless piping recently shipped to a well known manufacturer. Piping is made up entirely of *ESCO*'s cast stainless fittings and Spuncast pipe.

This centrifugally cast pipe is produced in a wide variety of standard and special analyses, and in schedule 40 wall or heavier. It is superior in resistance to corrosion, in withstanding wear or abrasion, and in mechanical strength. And under present regulations . . .

You still can get it.

Also available are stainless castings, valves, pipe fittings, flanges, etc.

Full information on *ESCO* Spuncast pipe is contained in our new catalog "Stainless and High Alloy Products". If you don't already have a copy, we suggest you get one from your nearest *ESCO* representative; or send us the filled-in coupon.

ESCO STAINLESS AND HIGH ALLOY STEELS

ELECTRIC STEEL FOUNDRY

2143 N. W. 25th Avenue, Portland 10, Oregon

Sales Offices and Warehouses

CHICAGO, ILLINOIS	NEW YORK CITY, NEW YORK
HONOLULU, T. H.	SAN FRANCISCO, CALIFORNIA
HOUSTON, TEXAS	SEATTLE, WASHINGTON
LOS ANGELES, CALIFORNIA	SPOKANE, WASHINGTON
EUGENE, OREGON	MEDFORD, OREGON

IN CANADA — *ESCO* LIMITED, VANCOUVER, B. C.

ELECTRIC STEEL FOUNDRY
2143 N. W. 25th Avenue, Portland 10, Oregon

Please send me a copy of catalog "Stainless and High Alloy Products".

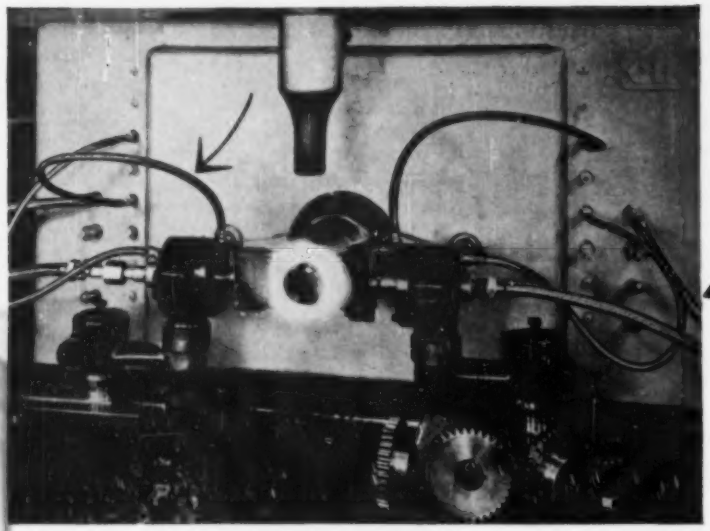
Name_____

Company_____

Address_____ Zone_____

City_____ State_____

What kind of work does a **Flexible** connector do?



On this electronically controlled Cincinnati Flamatic Hardening Machine, 3/16" I.D. American Flexible Bronze Seamless Tubing connects the water coolant inlet and outlet lines to the adjustable flame heads. Similar 1/2" I.D. Seamless Tubing conveys gas for the hardening flame.

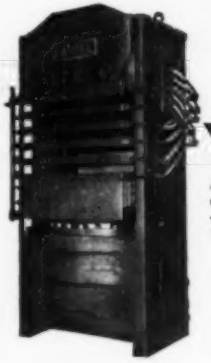
American Vibration Eliminators isolate compressor line vibration on this truck refrigeration unit installation which was made by The Schnabel Co. of Pittsburgh. Freon gas at 180-200 lb. pressure is carried in the lines.

If connectors must move, absorb vibration, make short bends, connect misaligned ports or make cramped connections, that's the kind of work American Flexible Metal Hose and Seamless Flexible Tubing are designed to do.

They can convey liquids, gas and semisolids under severe conditions of temperature, pressure and corrosion. They supply protective armor for flexible drive shafts, delicate instrument tubing and electrical wiring.

Bulletins SS-50 and CC-300 illustrate the versatility of American Flexible Metal Hose and Seamless Tubing and the many types available. Let us send you copies. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

51243

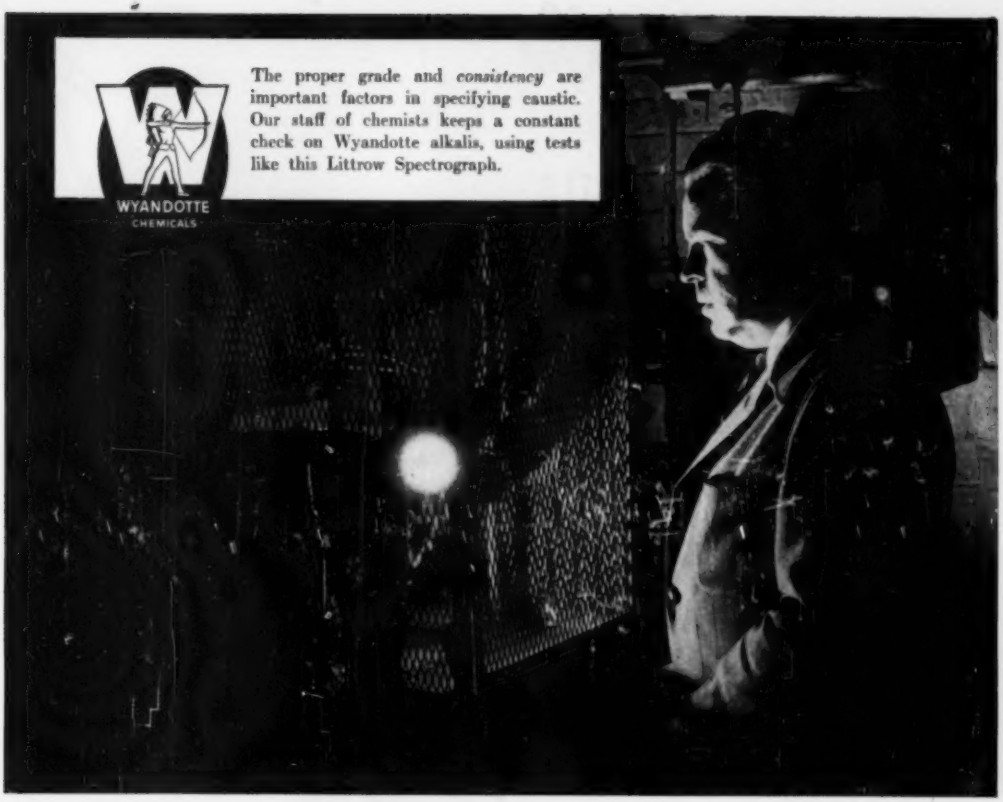


American Bracketubes are used on this Farrel-Birmingham 42" x 42" vulcanizing press to carry steam to the platens.

wherever connectors must move . . .

American ANACONDA

FLEXIBLE METAL HOSE AND TUBING


WYANDOTTE
CHEMICALS
The proper grade and *consistency* are important factors in specifying caustic. Our staff of chemists keeps a constant check on Wyandotte alkalis, using tests like this Littrow Spectrograph.

These tests PROVE THE CONSISTENCY of every grade of Wyandotte Caustic!

Complete analyses of Wyandotte alkalis (read how you can make them) assure you of consistency and other advantages.

Among the many grades of Wyandotte Caustic Soda, you'll find the grades best suited to your needs . . . for soaps and detergents; food processing; paint, inks, and dyes; for insecticides, textiles, and lubricants.

Wyandotte Mercury Cell Caustic, for instance, meets the most *exacting* specifications. It's as pure as reagent grades! One manufacturer used to purify caustic in his plant — now uses Mercury Cell, eliminating the need for purification!

Complete alkali line

For caustic soda, soda ash, and bicarbonate of soda, for chlorine and calcium chloride, you'll find Wyandotte a reliable *and helpful* source.

Our experienced staff of chemists is at your service for technical help. As a service to you, they have collected into a handy booklet the analysis procedure (mentioned above) for caustic, soda ash, and bicarb. A copy is yours for the asking. Why not write for it? — or for product data or technical help? *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in Principal Cities.*

Wyandotte
CHEMICALS

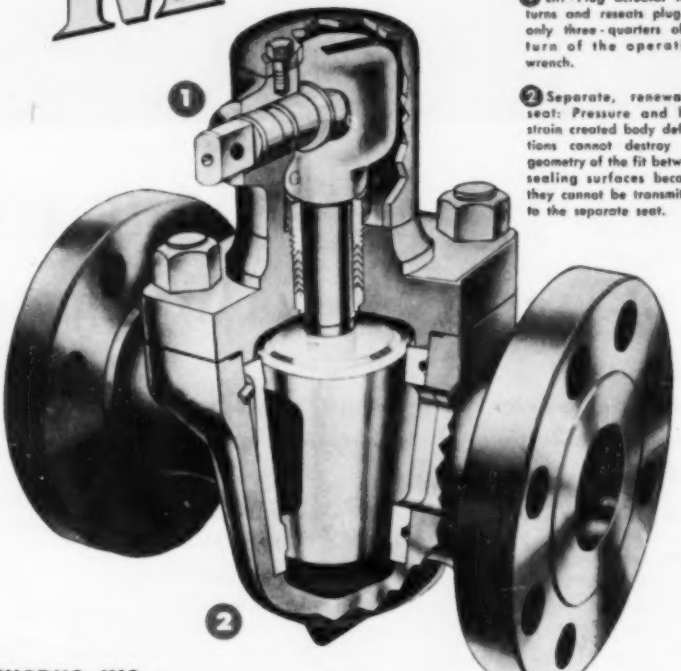
Cameron

NON-LUBRICATED

LIFT-PLUG VALVES

set a new performance record in

MOLTEN METAL SERVICE



1 Lift-Plug actuator lifts, turns and reseats plug in only three-quarters of a turn of the operating wrench.

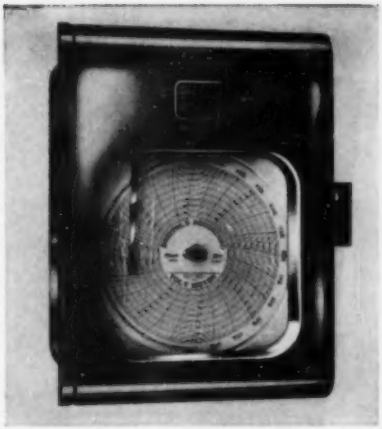
2 Separate, renewable seat: Pressure and line strain created body deflections cannot destroy the geometry of the fit between sealing surfaces because they cannot be transmitted to the separate seat.

Molten lead, sodium and other high temperature services ranging up to 1600° F. are now being handled successfully with Cameron Non-Lubricated Lift Plug Valves. Utilizing the basic mechanical design of the Cameron Valve illustrated in cross-section at right, and employing special high temperature-resistant seals, these remarkable valves are performing with complete satisfaction in such difficult services where ordinary valves have required replacement every few weeks.

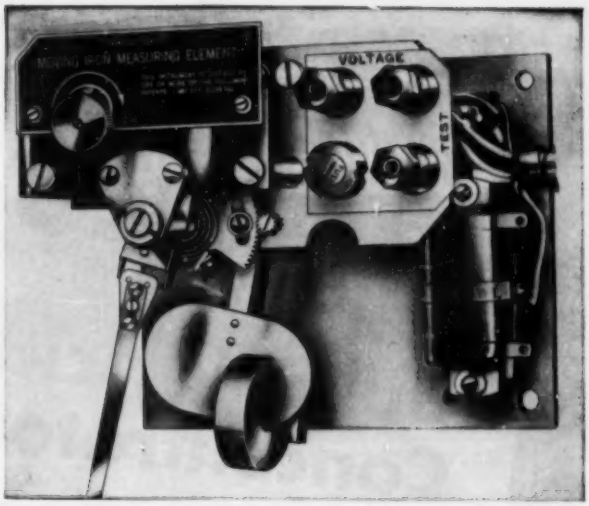
Cameron IRON WORKS, INC.

P. O. BOX 1212, HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y.
Represented in the sterling area by: British Oilfield Equipment Co., Ltd., Duke's Court, St. James's, London S.W.1, England.



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: **PORTABLE INSTRUMENTS** are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



NEW MOVING-IRON MEASURING MECHANISM. High torque, low burden, rugged construction for assurance that the original calibration will be retained through years of service. Shock-absorbing stainless steel bearings.

NEW RECORDING VOLTMETERS AND AMMETERS ANNOUNCED BY BRISTOL

THE LATEST DEVELOPMENT IN ELECTRICAL MEASUREMENT

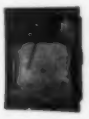
Outstanding for—High actuating torque... Low electrical burden... Stability of calibration... Dependable accuracy

Here is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years of experience in building recording voltmeters and ammeters for almost every application.

The new moving-iron measuring mechanism is a type known for high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, snap-on chart plate.

To keep up with the latest in recording instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.



THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

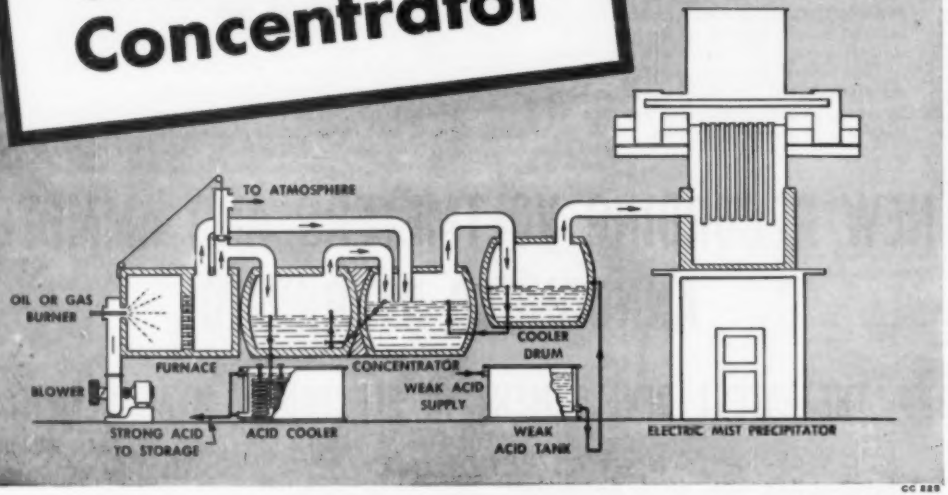
for highest efficiency

CHEMICO

DRUM-TYPE

Sulfuric Acid Concentrator

Hot air about 1100F is blown through a series of two acid baths where it quickly gives up most of its heat and emerges at a temperature a little above that of the acid itself. The high concentration is carried on in the front chamber. The hot gases leave the front chamber and enter the rear chamber into which the weak acid is fed. An additional cooler drum is used on high capacity units.



CC 889

For high strength sulfuric acid concentration, the Chemico Drum-Type Concentrator is *most efficient* where a reasonably large and continuous quantity of acid is to be concentrated and either oil or gas is available as fuel.

As the diagram and description of the process show, the major advantage of this Drum-Type System lies in its *complete utilization of direct heat.* This accounts for the high economy of this Chemico method of concentration. The process is continuous. Only *one* control man is needed per shift, even for multiple units.

Where sulfuric acid contains iron sulfate, Chemico offers the High-Temperature Concentrator. The Flash-Film Concentrator may be used efficiently where low cost steam is available for heat, or if acid quantities are small or intermittent. Whatever your sulfuric acid concentration problem, it pays to consult Chemico.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

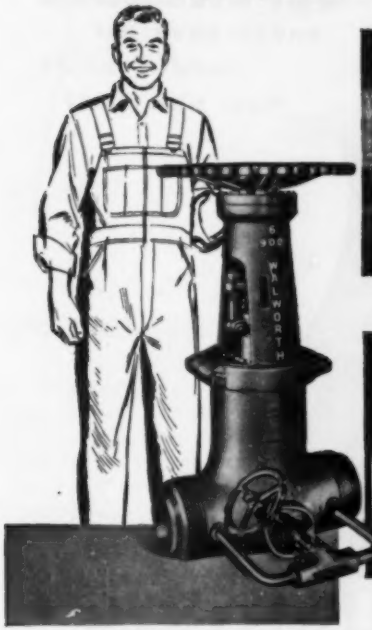
EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., NORTH WEST WING, BUSH HOUSE, ALDWYCH, LONDON W.C. 2, ENGLAND

Chemico Plants Are Profitable Investments

WALWORTH *Pressure-Seal* VALVES

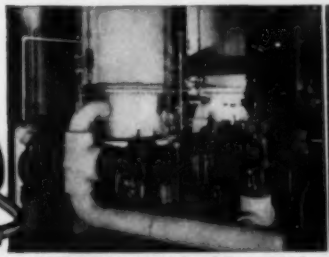
For high-pressure, high-temperature services



Walworth 6-inch Series 900 Pressure-Seal Gate Valve with Series 1500 Y-type Globe Valve on the by-pass.

CHEMICAL PLANT: Walworth Pressure-Seal Valves in the pressure reducing station of a chemical plant.

MARINE: Walworth Pressure-Seal Valves aboard the S.S. "Wilfred Sykes"—largest Great Lakes ore carrier.



LIGHT AND POWER: Walworth Pressure-Seal Valves equipped with motor operators, in an eastern public utility plant.

PAPER MILL: Fabricated header with 8-inch Series 600 Pressure-Seal Y-Globe Non-Return Valves and Series 600 Pressure-Seal Gate Valve.

SMALL VALVES FOR HIGH PRESSURE-TEMPERATURE SERVICE

Series 1500 Cast Steel Y-type Globe and Angle Valves in sizes ¼ to 2 inches.

The bonnet and body design of Walworth Pressure-Seal Valves is such that the pressure within the valve is used to prevent leakage at the junction of the bonnet and body. The bonnet joint of the Walworth Pressure-Seal Valve is permanently tight because there is no dependency on the ability of any component part of the joint to resist creep during long exposure to high temperature. Sudden temperature and pressure changes do not affect this tightness. Bonnet flanges and studs are eliminated and the weight of the valve is reduced.

An improved flexible disc design maintains seat tightness, even when the valve body is distorted by pipeline stresses or by temperature and pressure changes. This improved disc design makes it easier to open and close this valve.

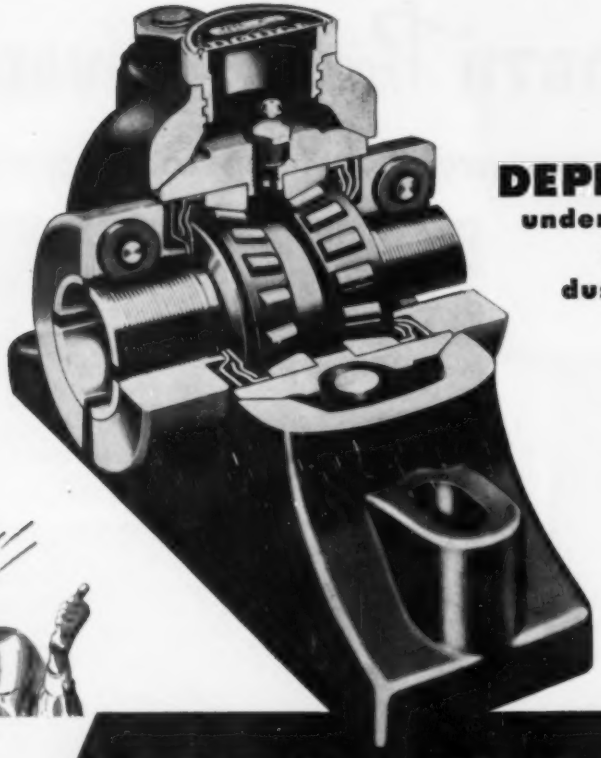
Walworth Pressure-Seal Valves are easy to disassemble and assemble, and are the most satisfactory valves for high-pressure, high-temperature service. They are available in Series 600, 900, 1500, 2500 and in a wide range of sizes and types. For further information, write for Circular 116.

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



DEPENDABLE
under severest conditions of dust and dirt!

DODGE-TIMKEN

- Even under layers of grime, dirt and abrasive dust encountered in many production operations, the Dodge-Timken Type C bearing carries its power load smoothly, efficiently, without interruption—because it's
- Triple-sealed to prevent the entry of dust, however fine. Accurately machined steel seals keep dirt *out* and lubricant *in*.
- Dodge mounts, seals, houses Timken precision bearing units in rugged assemblies (four different types) to deliver a minimum of 30,000 hours uninterrupted service.
- Dodge Timken Type C Pillow Blocks are fully self-aligning, with both radial and thrust carrying capacity.
- Delivered fully assembled, adjusted and lubricated, ready to lock on shaft. Locking collars at both ends insure firm fastening.
- Normally available from Dodge Distributors' stocks, sizes from 1-7/16" to 4-15/16".

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor for assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

TORQUE-ARM SPEED REDUCERS

4. ROLLING GRIP AND DIAMOND B CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS

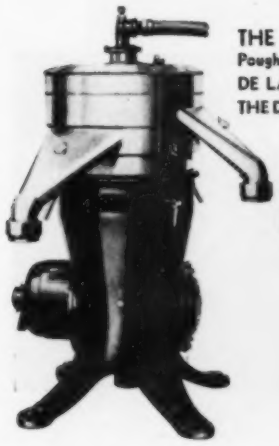
NO TIME FOR *Interruption!*

Processing, too, must be continuous to be profitable. De Laval centrifugal machines eliminate unnecessary interruptions in the separating or clarifying phases of a process and thus do in a matter of seconds work that once took minutes or even hours by settling or filtering methods.

De Laval centrifuges have three basic applications: (1) continuous separation of two liquids, (2) continuous clarification of one or two liquids and (3) continuous separation of two liquids plus the simultaneous continuous removal of solids from one or both liquids.

Every liquid mixture presents its own problems of specific gravity, viscosity and type and concentration of solids. Each application can best be met with the De Laval machine that precisely meets the need. Ask a De Laval engineer which machine would do *your* job best.

● Write for further information.



THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

The answer to faster, better processing is uninterrupted
CONTINUOUS SEPARATION (or Clarification) *with* DE LAVAL CENTRIFUGALS

De Laval

keeps your separation CONTINUOUS for better, faster, more profitable results

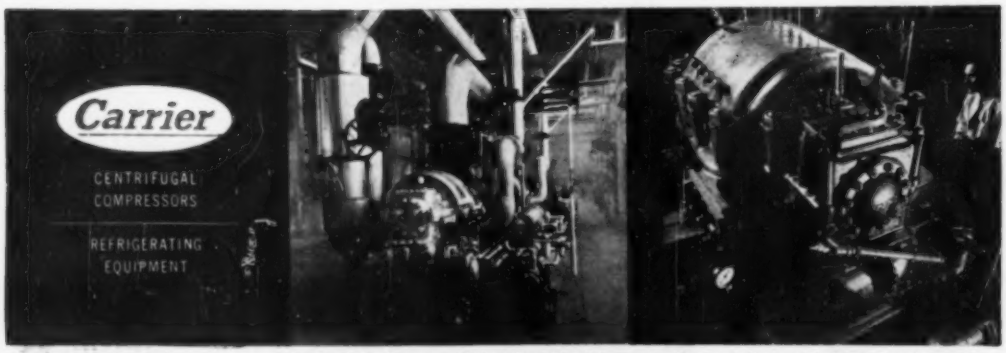
Is there a gas we haven't met?

Our Carrier Centrifugal Compressors have compressed more different gases on the job than those of any other manufacturer. We think experience like that is important to you.

Maybe you work with butane or propane. Ethylene, methylene chloride, ethane or chlorine. Air, oxygen, sulphur dioxide or hydrogen sulphide. All of these and many more have been used in our Centrifugal Compressors at some time or other during the past thirty years. So there's a lot of experience for you to draw upon when you call on Carrier.

Carrier Centrifugal Compressors are available in standard designs from 2000 to 40,000 cfm, with three to seven wheels. In most cases they need no individual engineering. And they're built from standard, pretested components — you're sure of good performance right from the start.

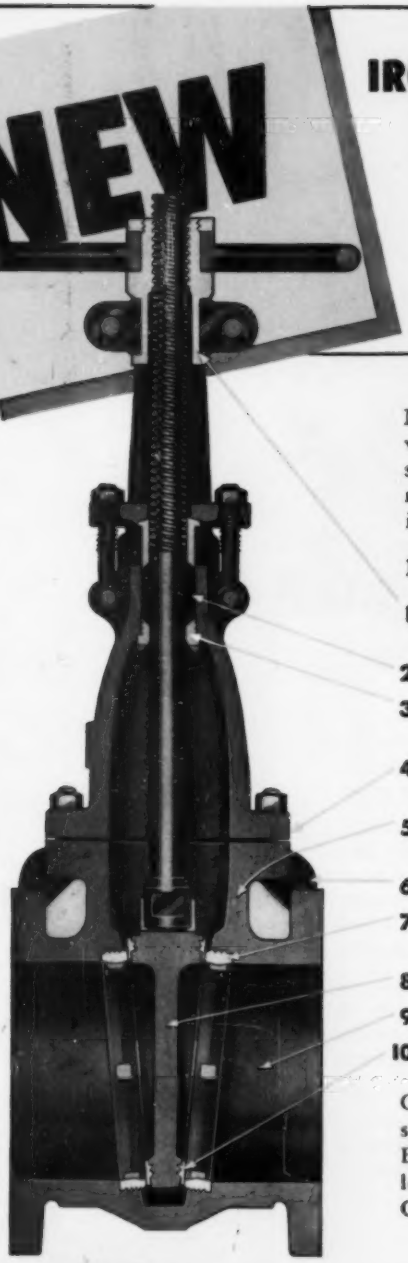
There's a lot more to our Centrifugal Compressor story, of course. Why not consult the Carrier office nearest you? Or write Carrier Corporation, Syracuse 1, New York, for the catalog, "Centrifugal Compressors for Industry."



Carrier has built more multi-stage Centrifugal Compressors than any other manufacturer. Here is one of them (left) on the job at a petroleum company. Skilled workmanship, precision inspections (right) and grueling tests make Carrier Centrifugal Compressors the most dependable you can buy.

IRON VALVES that give you Steel Valve Features

OIC
FOUNDED 1881



NOW the workhorse of the family—OIC's iron valve—offers you features formerly found only in steel valves. It's a brand new valve built around more than a third of a century's experience in making iron valves. We kept only the old handwheel.

Examine these construction details:

1 Lubricated yoke bushing, renewable without removing bonnet.

2 Deeper stuffing box; longer packing life.

3 Inserted back seat bushing permits repacking under full pressure.

4 Stronger body-bonnet joint; uniform gasket compression.

5 Better metal distribution, reduced weight, increased strength.

6 Sturdy tie-ribs; added resistance to pipeline stresses.

7 End-seated bronze seat rings will not loosen in service.

8 I-Beam type solid wedge, accurately guided.

9 Straight-through port areas reduce flow resistance.

10 Rolled-in seat facings on wedges give longer life.

OIC's new line of Iron Valves gives you longer service, lower upkeep and greater security. For Bulletin 805 telling you all about them, call your local OIC distributor or write The Ohio Injector Company, Wadsworth, Ohio.

OIC
FOUNDED 1881

VALVES

FORGED AND CAST STEEL · IRON · BRONZE

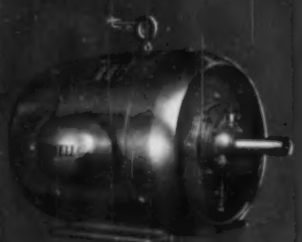
This machine practically thinks for itself!

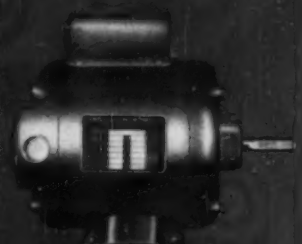
It's uncanny the way this DeVlieg JIGMIL handles the most complex boring and milling operations *automatically*, simply by pushing a button on the control panel.

For example — by simple push button control, the workpiece is positioned both horizontally and vertically, and holes are automatically spaced and bored to exact tolerances. A unique index table allows machining of parts from four sides without rechucking. A power tool lock permits locking or releasing cutting tools in a few seconds.

Howell engineers worked closely with this manufacturer to make sure each of the five Howell motors fitted its job exactly. The three 2-speed and two single-speed Howell motors make a vital contribution to the remarkable efficiency of this machine.

Howell will supply the same high degree of engineering skill and experience to your problems. You are assured of quality motors designed for your specific requirements, built to stand up under the heaviest production loads. May we handle your electric motor needs?





HOWELL Red Band MOTORS

HOWELL MOTORS

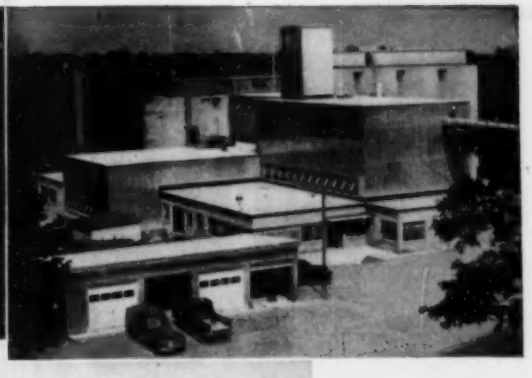
HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built industrial motors since 1915

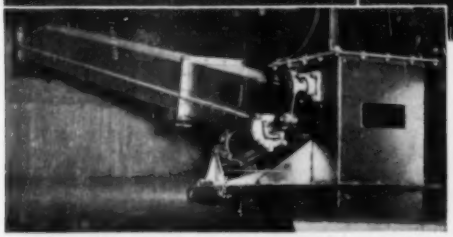
how F-K PUMPS and F-H AIRSLIDE®

convey talc at Gouverneur

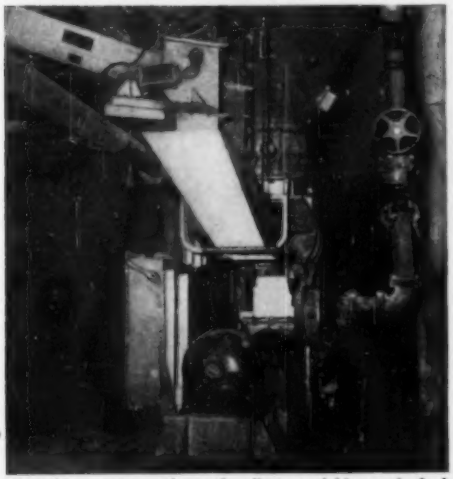
Safely Simply Efficiently Economically



Loading bulk talc in box car.



Airslide equipped with air motor-operated cut-off gate.



Portable pump underneath silos; variable-speed feeder attached to cone of silo. Airslide (upper left) from flat-bottom bin, for delivery to pump.

Gouverneur Talc Company has virtually standardized on Fuller conveying equipment in its Gouverneur, N. Y. plant. The Fuller-Kinyon Conveying System and F-H Airslide are used wherever possible.

The original installation consisted of four storage silos served by a Fuller-Kinyon Portable Pump, conveying to packer bin and bulk-car loading. Talc from these silos is delivered to the pump by variable-speed feeders which regulate the pump capacity to conform with packing facilities.

Later, storage facilities were increased by building a number of flat-bottom storage bins adjacent to the original silos. For economical, convenient movement of material from these bins, F-H Airslides were installed for delivery to the pump. Airslides are equipped with air motor-operated cut-off gates, actuated by bin-level indicators in the packing bin.

In addition to the F-K Portable Pump under silos, there are three other F-K Pumps installed in the Gouverneur plant, two for conveying from pulverizers, and one from dust collectors, delivering to silos and bins. Each pump is served individually by a Fuller Rotary Compressor, furnishing air for conveying.

Gouverneur is just one of the many plants which has streamlined operations with pneumatic conveying. Installation of this better method of handling materials will prove of great advantage to you. Why not have a Fuller engineer analyze your present conveying methods. He will recommend the most efficient and economical system for your plant. No obligation, of course.

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS—FEEDERS, AND ASSOCIATED EQUIPMENT

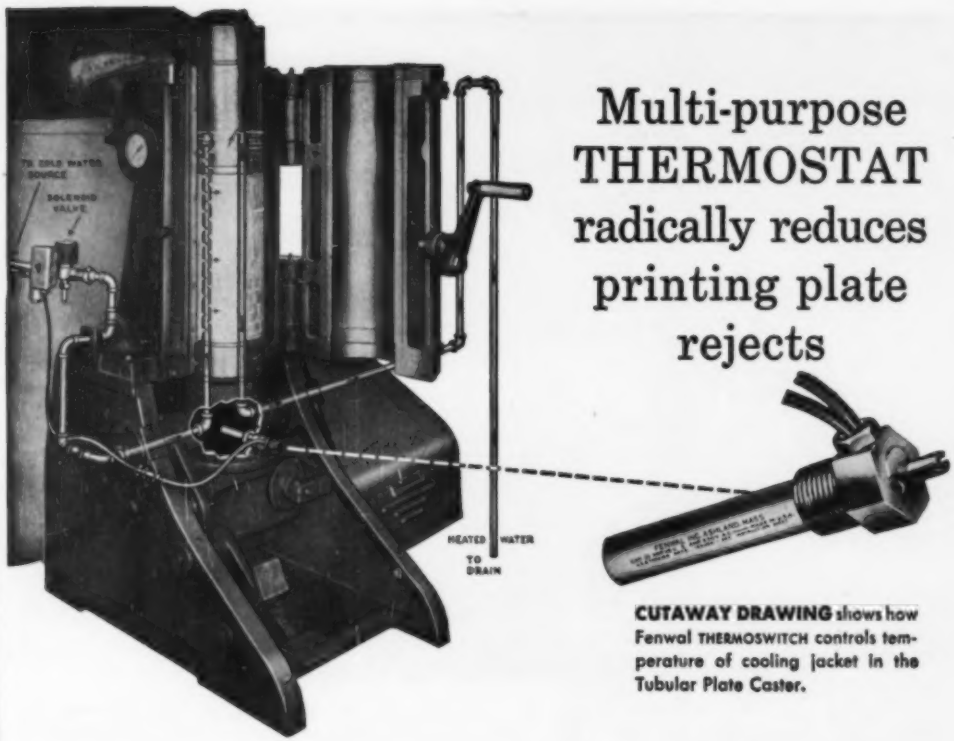
FULLER COMPANY
Catasauqua, Pa.

Chicago 3
120 S. LaSalle St.

San Francisco 4
420 Chancery Building

G-65

Multi-purpose THERMOSTAT radically reduces printing plate rejects



CUTAWAY DRAWING shows how Fenwal THERMOSWITCH controls temperature of cooling jacket in the Tubular Plate Caster.

The Tubular Plate Caster machine used in the production of printing plates at the Nordmann Printing Company, 4210 Chippewa St., St. Louis was the seat of considerable trouble when it was water cooled by a hand valve. If too much cold water was run into the cooling jacket, the temperature was reduced so fast that the plates shrank. If too little water entered, the temperature remained too hot and plates became porous. In either case, plates had to be remelted and recast with resultant loss of labor and time.

The problem was solved by replacing the hand valve with a solenoid water valve and installing a low-cost Fenwal THERMOSWITCH thermostat. This unit opens the valve when water gets too hot. Cold water then flows in, hot water drains off, and valve is shut when proper water temperature is reached. *As a result, rejects have been practically eliminated.*

This is but one of many ways in which easy-to-install, easy-to-maintain Fenwal THERMOSWITCH Units effectively control variables where heat is a factor. Their unique principle of operation consists of an activating control element that is a single-metal shell. This shell expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts.

Fenwal THERMOSWITCH thermostats can no doubt help you in your own processing. Find out how by mailing the coupon today.

Fenwal
THERMOSWITCH
The Precision Multi-Purpose Thermostat Control
SENSITIVE . . . but only to heat

FREE! Get this bulletin . . . see what Fenwal THERMOSWITCH units can do for you. *Just fill in coupon and mail . . . no obligation.*

FENWAL, INCORPORATED, 166 Pleasant St., Ashland, Mass.
Los Angeles, Cal.
TEMPERATURE CONTROL ENGINEERS

Name ..... Position .....
Company .....
Street .....
City ..... Zone ..... State .....

I am chiefly interested in the applications checked:

- ☐ Heating
- ☐ Cooling
- ☐ Humidity Control or Detection
- ☐ Alarm (over-temperature, under-temperature)
- ☐ Vapor Control
- ☐ Timing (thermal)
- ☐ Radiant Heat Control
- ☐ Pressure Control (by controlling vapor temperature)

OTHER (Please fill in your special requirements) .....
.....
.....

BE SURE OF UNIFORM
HIGH QUALITY – SPECIFY

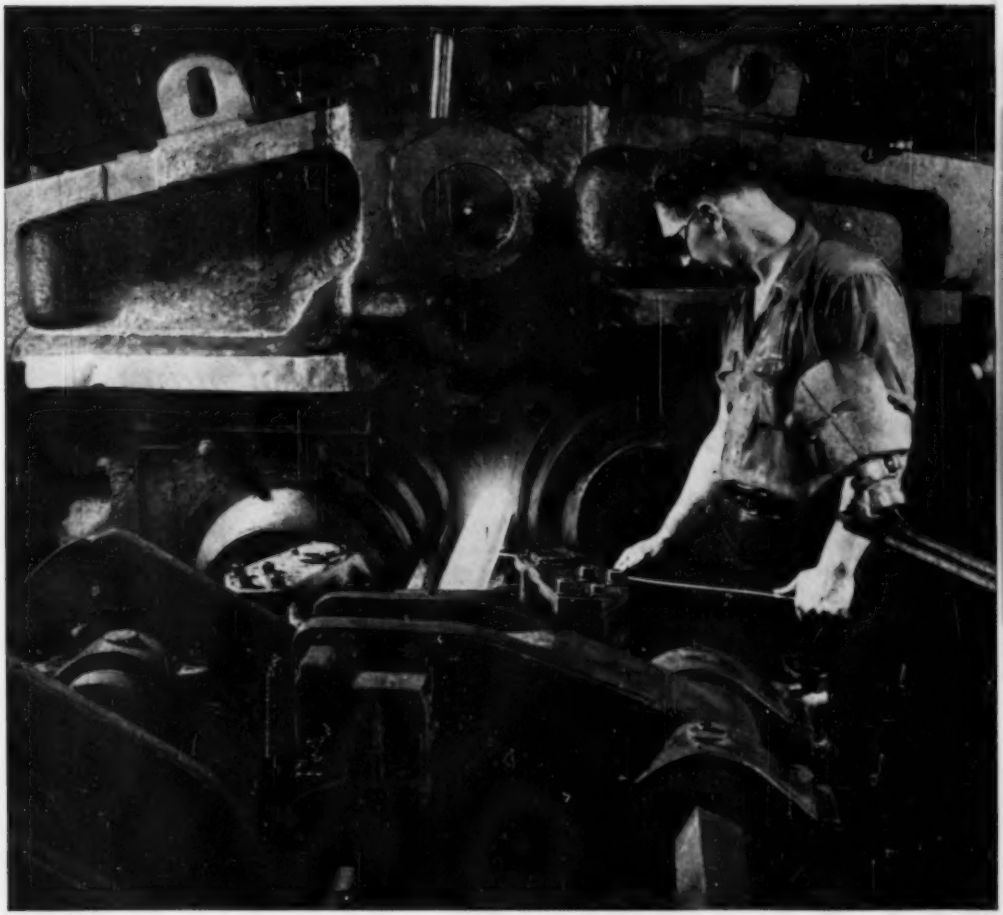
GLOBE
STEEL TUBES

...PRODUCT OF A LEADING
AND SPECIALIZED PRODUCER

From the massive mill that pierces the white-hot billet, through every step in processing, to final checks and tests in the laboratory, Globe processes are *specialized* . . . specialized to give you high quality — uniformity of diameter, concentricity, wall thickness.

Globe has *specialized* in the research, engineering, and manufacture of steel tubes for more than 30 years. Advanced machinery and methods — rigid inspection and quality controls — characterize all production operations from billet to finished tube. Write for the Globe general catalog.

GLOBE STEEL TUBES CO., Milwaukee 46, Wisconsin
Chicago • Cleveland • Detroit • New York • Houston • St. Louis
Denver • San Francisco • Glendale, Cal. • Philadelphia
Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globe-iron seamless high purity ingot iron tubes — Globe Welding Fittings.

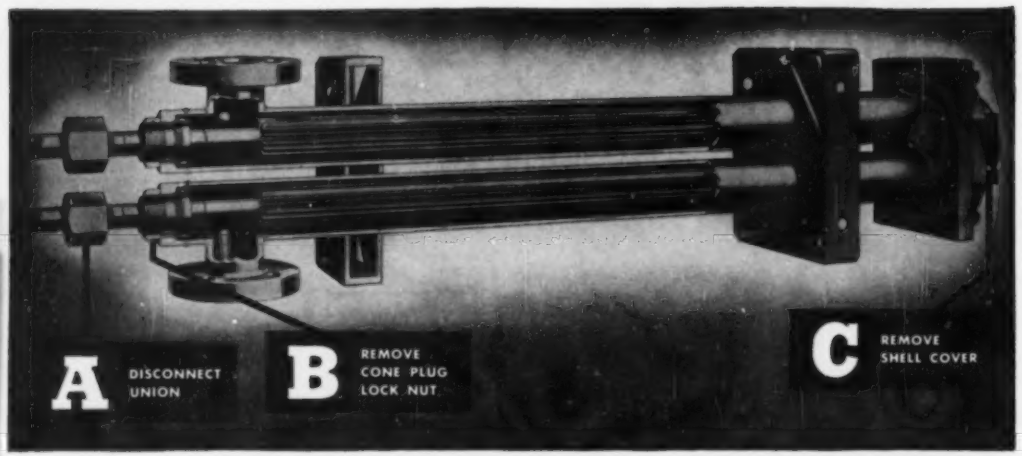


Globe Steel Tubes Are Available In:

- STAINLESS STEELS — GLOBE SEAMLESS
- STAINLESS STEELS GLOWELD WELDED
- ALLOY STEELS
- CARBON STEELS
- STANDARD AND SPECIAL ANALYSIS STEELS
- HIGH PURITY IRON — GLOBEIRON
- CORROSION RESISTANT STEELS
- HIGH-TEMPERATURE SERVICE STEELS
- MECHANICAL AND PRESSURE TUBING

GLOBE TUBES

as easy as A B C



Convenient Withdrawal of Heat Transfer Elements...one of many **TWIN G-FIN SECTION** *Advantages*

When you want to withdraw the heat transfer element of a G-R Twin G-Fin Section for inspection or cleaning, you need only remove 3 parts. No other heat exchanger has this advantage.

And this simplicity is typical of the Twin G-Fin Section. Its *design* is simple . . . it consists essentially of a pipe within a pipe . . . no tube sheets, no baffles, no internal joints to keep tight. Its *installation* is simple . . . these light-weight standard interchangeable units are readily handled; are easily stacked and connected in series or parallel for the desired capacity and temperature ranges. Its *maintenance* is simple . . . the operating records of more than 40,000 units, some of them in service for more than 15 years, have conclusively proven its durability and low upkeep cost.

Whatever may be your heat transfer requirements, investigate this universal heat exchanger . . . used on a greater variety of condensing, cooling and heat exchanger services than any other design of apparatus.

Write for Bulletin 1614, describing the many advantages and applications of the G-R Twin G-Fin Section.

GR—191

THE GRISCOM-RUSSELL CO., 285 MADISON AVENUE, NEW YORK 17, N. Y.

GRISCOM-RUSSELL

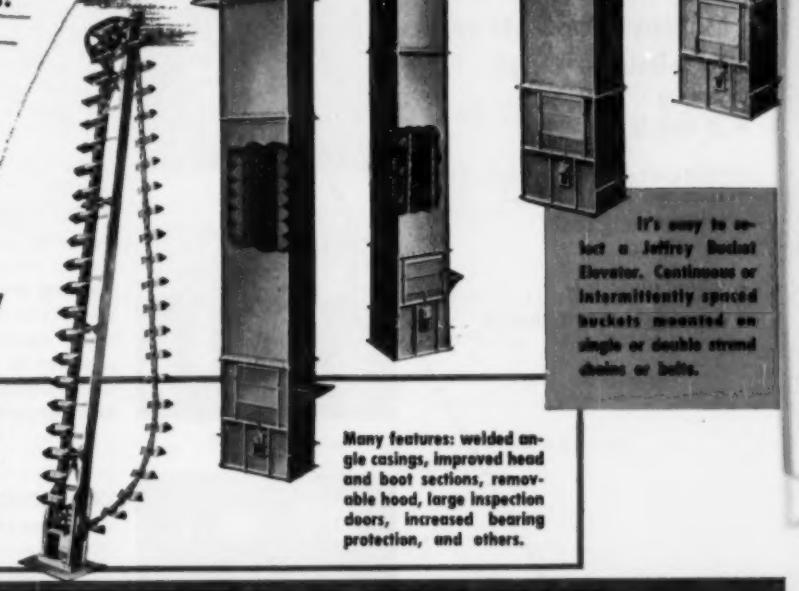
Pioneers in Heat Transfer Apparatus

on the "UP and UP"

Meaning you can DEPEND upon a Jeffrey Bucket Elevator if you have material to be lifted so that something else may be done with it. Step UP your production schedules . . bring costs down. In addition, you save time and expense in making layouts and drawings . . we have worked out a complete line of standards. A type and size to meet your requirements.

Other Jeffrey Products:

Bin Valves
Belt Idlers
Car Pullers
Chains
Conveyors
Coolers
Crushers
Dryers
Feeders
Pulverizers
Screens
Transmission Machinery
Weigh Feeders



It's easy to select a Jeffrey Bucket Elevator. Continuous or intermittently spaced buckets mounted on single or double strand chains or belts.

Vertical or inclined, with or without casings and many features for economical operation. It is a step forward to select a Jeffrey Bucket Elevator.

Many features: welded angle casings, improved head and boot sections, removable hood, large inspection doors, increased bearing protection, and others.

THE JEFFREY MANUFACTURING COMPANY
ESTABLISHED 1877
909 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

3 steps to successful

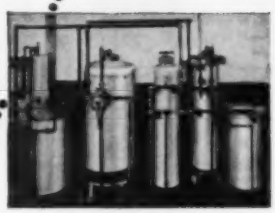
ION EXCHANGE PERFORMANCE

Whether it is a simple greensand softener or a large demineralizing plant, these three essential steps are necessary to produce an ion exchange installation which:

- is easy to operate
- requires low chemical regenerating costs
- yields uniformly dependable performance

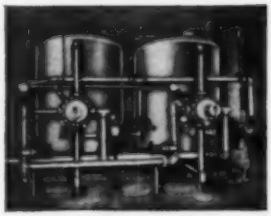
LABORATORY RESEARCH

Graver chemists and technologists are continually evaluating the performance of many ion exchangers to determine the optimum operating conditions for each. As a result of this work the specific advantages of more than forty available Graver ion exchangers can be effectively applied to a wide range of processes.



PILOT PLANT OPERATION

Graver development engineers regularly conduct tests on small scale pilot units operating under simulated plant conditions. These tests serve to check laboratory experiments and to work out problems in mechanical design. This assures dependable operation of the ion exchange equipment under actual service.



COMMERCIAL EXPERIENCE

A background of thirty years' successful commercial experience is reflected in the design of Graver equipment. Graver chemical engineers have pioneered the commercial application of many new ion exchange processes. Dependable service is assured as a result of this experience.

Write for the following reprints:

"Operating experience with Resin Zeolites on the Hydrogen Cycle"

"Present Practices in the Use of Ion Exchangers in Water Treatment"

"Silica Removal by a Practical Ion Exchange Process"

GRAVER WATER CONDITIONING CO.

216 West 14th Street, New York 11, New York, U.S.A.

GW-452

GRAVER

A DIVISION OF GRAVER TANK & MFG. CO., INC. EAST CHICAGO, IND.

KEY-KAST

alloy welding fittings . . .

engineered for longer life

- **Greater wall thickness throughout**
- ***Extra* thickness in critical areas**

Give *your* piping system these advantages of KEY-KAST Alloy Steel Welding Fittings!

Produced in low . . . intermediate . . . and various stainless steels in all shapes, sizes and schedules.

NEW BULLETIN gives complete facts on the new Key-Kast line. Send for your copy today. (Please make request on your letterhead.)

- **Greater allowance against erosion and corrosion—with extra thickness at critical areas.**
- **Increased structural strength—with greater wall thickness throughout.**
- **Lower unit cost.**
- **Meet A.S.M.E., ASTM, ASA Codes.**
- **Bosses provided for tapped openings.**
- **Controlled quality . . . through rigid metallurgical control . . . produced . . . inspected . . . tested in *one* plant.**

Key Company

P. O. BOX 494-B • EAST ST. LOUIS, ILLINOIS

Since 1916 . . . Pioneers in Developing and Manufacturing Products for High Pressures and Temperatures.

PROMPT DELIVERIES!
Wire or write your alloy fitting needs.

DISTRICT OFFICES: NEW YORK • CLEVELAND • CHICAGO • TULSA • HOUSTON • LOS ANGELES

Polyol Shortage is Over!

SORBITOL IS USED FOR:

Candy	Shaving Cream
Cellulose and Paper Products	Shoe Dressings
Cosmetics	Shredded Coconut
Dentifrices	Textile Finishes
Gelatin	Tobacco
Pharmaceuticals	Water Soluble Resins

GLUE SPECIALTIES:

Bookbinding Glues	Cork Binders
Greaseproof Composition	Non-warp Glues
Printers' Rollers	Vegetable Adhesives

FOR SYNTHESIS OF:

Resins	Varnishes
Surface Active Agents	Vitamin C

Regardless of your polyol (polyhydric alcohol) requirements for the present or the future . . . you can meet most of them with sorbitol from Atlas at a low, stable price!

Atlas sorbitol is *not* affected by raw material shortages, war, or wild price fluctuations. It is derived from an almost inexhaustible supply of sugar!

Sorbitol and other related Atlas polyols . . . members of the same chemical family as glycerin and the glycols . . . are *not* substitutes. In fact, they possess unique and outstanding qualities that make them superior to all other conditioners for many purposes.

This unlimited source of Atlas polyols can eliminate problems in supply and price fluctuations for you . . . as it has for many manufacturers in many fields. Write for latest information on sorbitol and methods of application in your industry.

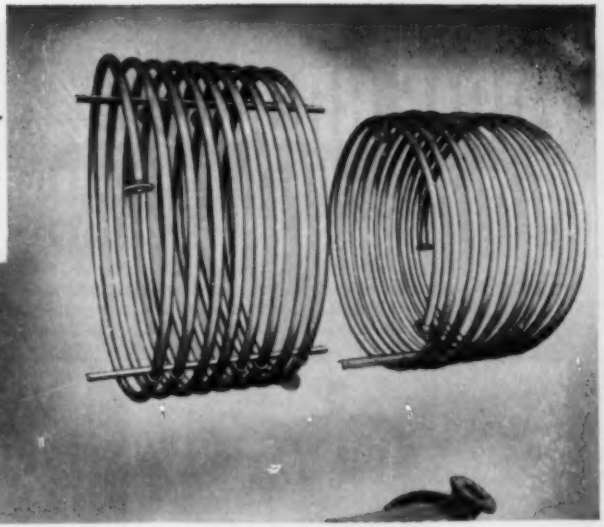
Industrial Chemicals Department

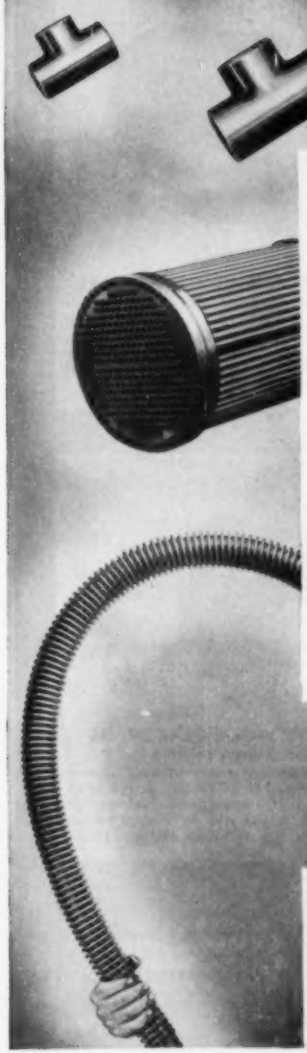
ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE • OFFICES IN PRINCIPAL CITIES

ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

IDEA for your FUTURE PLANNING file





Useful Information About A Sulphuric Acid-Resisting Stainless Steel

This new 20-page book contains complete information about Carpenter Stainless No. 20 in all forms, sheet, plate, tubing, bar stock, etc. If you now have the typewritten bulletin about No. 20, be sure to replace it with this book containing information never before published. While the use of Stainless No. 20 is limited under present conditions, we want to keep you up-to-date on its performance.

This book contains many field reports describing No. 20's resistance to corrodents such as

Acetic anhydride	Mixed acids
Alkylate	Phosphoric acid
Fluoborate solutions	Sulphuric acid
Maleic acid	Zinc phosphate, etc.

For your copy, just write us a note on your company letterhead.

THE CARPENTER STEEL COMPANY

Alloy Tube Division, Union, N. J.

Export Department: The Carpenter Steel Co., Reading, Pa. "CARSTEELCO"

Carpenter STAINLESS NO. 20

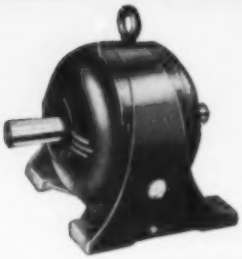
Licensed under patents of The Duriron Co., Inc.

FOOTE BROS. *Enclosed Gear Drives*

HIGHEST IN QUALITY • SUPERIOR IN PERFORMANCE

WIDE RANGE OF TYPES AND SIZES

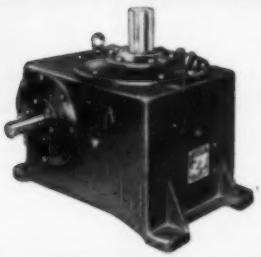
Enclosed Gear Drives—a size and type to meet every application. The latest in gear-cutting equipment backed by nearly a century of engineering and manufacturing experience. New techniques, better control of material, improved manufacturing methods—all assure superior enclosed gear drives.



LINE-O-POWER STRAIGHT LINE DRIVES
Available for prompt delivery
High quality Duti-Rated Gears permit maximum power in minimum size. These drives are economical, both in original cost and operation. Double or triple reductions with ratios from 5 to 1 up to 238 to 1 and capacity range from 1 up to 200 h.p. Write for Bulletin LPB.

FOOTE BROS.—LOUIS ALLIS GEARMOTORS
Available for prompt delivery
Duti-Rated Gears with file hard tooth surfaces and resilient cores assure long wear life and maximum load-carrying capacity. Wide range of highest quality motors in open drip-proof, splash-proof, enclosed and explosion-proof types. Write for Bulletin GMA.

HYGRADE HORIZONTAL WORM GEAR DRIVES
Available for prompt delivery
High in quality, compact in design, incorporating precision worm gearing. Available in a wide range of types to meet any need. Ratios from 4⅛ to 1 up to 4108 to 1. Capacities up to 260 h.p. Write for Bulletin HGB.



HYGRADE VERTICAL WORM GEAR DRIVES
Available for prompt delivery
Vertical output shafts extended either upward, downward, or both. Also available in Hytop design with wider low speed bearing span to accommodate vertical output shaft extensions. Ratios 4⅛ to 1 up to 4108 to 1. Capacities up to 260 h.p. Write for Bulletin HGB.

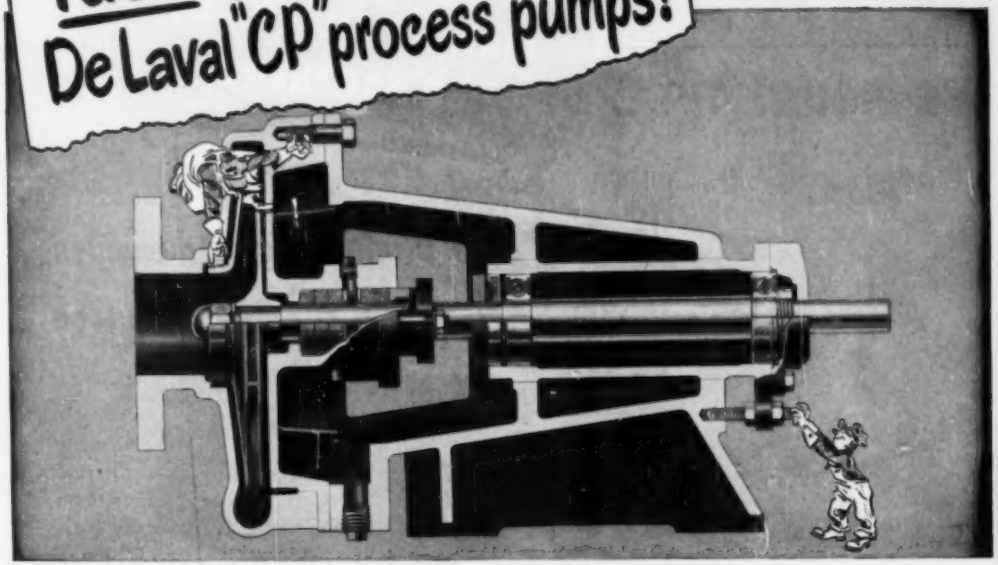
WRITE FOR INFORMATION...

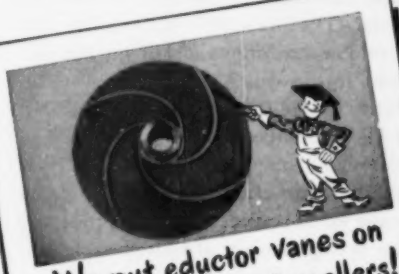
FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS.
GEAR AND MACHINE CORPORATION
4545 S. Western Ave.
Chicago 9, Illinois

Facts you should know about De Laval "CP" process pumps!





We put eductor vanes on the back of open impellers!

Why? Because the eductor vanes develop higher pressures than the pumping vanes. This reduces end thrust, relieves stuffing box pressure, keeps the back of the impeller clean and prevents binding . . . all important points that insure better operation and less maintenance.

NOW! You can adjust a pump for wear without opening it up!

How? It's easy if you have a De Laval CP pump. The secret is in the tapered wearing ring. This means you don't have to replace the wearing ring to restore the pump to its original efficiency. All you do is turn this external adjusting screw. This moves the entire rotor and impeller forward and permits you to adjust for proper clearance between the case and wearing ring . . . *it's as simple as that.*

DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

50th DE LAVAL Anniversary

CP-8

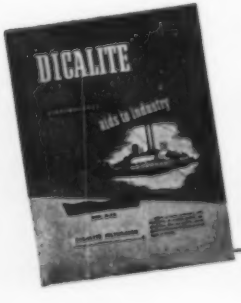
Here's what we meant by

Need help IN MAKING FILTERAIDS GO FARTHER?

A survey by a Dicalite Engineer enabled this manufacturer to cut filteraid usage by 66⅔% per gallon of throughput

One of the many products in this manufacturer's line is varnish. It was being filtered by precoat only, using 100 lbs. of filteraid to deposit on the cloths of a 200-sq. ft. plate and frame press before starting to filter each 1000-gal. batch. A survey by a Dicalite engineer led to saving both time and filteraid. First, a switch was made to a higher-flowing grade of Dicalite filteraid. Only 25 lbs. of this material (Dicalite 4200) was used for the precoat, but 75 lbs. were used in continuous addition to the varnish as it was being filtered. In this way 3,000 gallons were filtered with satisfactory clarity before the press needed cleaning. RESULT: 1) 100 lbs. of Dicalite filtered 3,000 gallons instead of the 1,000 gallons put through by the former method; 2) cycle length was tripled, so that two press cleanings were eliminated in filtering 3,000 gallons and saved considerable down time and overtime. Such spectacular savings are not always possible, but our engineers find many cases where filteraid consumption could be reduced 10% to 15% without any ill effects to operation or product quality. If you feel that a check of your filtration operation or stretching your available supply of filteraid will be helpful, or if you have a current filteration problem, write our nearest office. A Dicalite engineer will gladly call at your convenience.

Send for free copy of Bulletin B-12



DICALITE® FILTERAIDS

DICALITE DIVISION, GREAT LAKES CARBON CORPORATION

GLC

NEW YORK 17, N. Y. • CHICAGO 1, ILL. • LOS ANGELES 17, CALIF.

International

MINERALS & CHEMICAL CORPORATION

For more than ten years, *International* has been a major producer of potash salts at its mine near Carlsbad, New Mexico. Now, with its chemical manufacturing plant at Niagara Falls, New York, *International* provides for the first time in the industry a *three-way control* in the production of potassium chemicals. *Mining. Refining. Manufacturing: International's* basic position in the potash chemicals field assures effective control at every stage of production, and large tonnages of chemicals carefully prepared to specifications.

Address Inquiries to Industrial Potash Department:
20 North Wacker Drive, Chicago 6
61 Broadway, New York, 6

POTASH DIVISION

potash chemicals

Caustic Potash
All Standard Grades
Carbonate of Potash
All Standard Grades
Potassium Chloride-Refined
Potassium Sulfate

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

TYGON

Versus Cl_2

KEEP it dry and chlorine offers no trouble in handling. But, add even a trace of water and you have real corrosion problems. Problems that can cause costly damage, result in time consuming shut-downs, or constitute a serious personnel hazard. Wet chlorine must be controlled — can be controlled — easily and economically — through the proper use of the versatile TYGON family of plastic compounds.

Basically, the TYGON family consists of a series of skillfully modified and compounded vinyl resins in various physical forms: calendered or press-polished sheets; extruded tubing, channel or solid cord; molded goods; and coatings. Each form is especially suited to a particular application. Each has its use restrictions. However, all exhibit unusual general chemical resistance and desirable physical properties. All display outstanding resistance to chlorine under a wide range of conditions.

As a calendered or planished sheet, TYGON is generally used as a material of construction. In this form, it is resistant to all concentrations of chlorine at temperatures as high as 165°-175° F. When subject only to chlorine fumes, service temperatures can be raised to 200° F. Prolonged exposure to mixtures of chlorine and other chemicals, particularly solvents, is not advised without approval of U. S. Stoneware engineers.

Major use of TYGON sheets is in the lining or covering of tanks, vats, drums, hoppers, bins, blowers, impellers, fume hood and fume ducts. Considerable quantities are also die-cut into gaskets, washers and diaphragms for use as positive, durable seals, or separators, in all types of process equipment.

As extruded tubing, cord, or channel, TYGON resists chlorine in all concentrations within temperatures up to 200° F. Lengthy service with mixtures of chlorine and solvents is not recommended without qualified advice.

In extruded form, TYGON's main use is as a medium of transmission. TYGON Tubing has assumed a prominent position in both the laboratory and the plant. Its glass-like clarity, mirror-smooth surfaces, full flexibility, light weight, high strength, and long life make TYGON ideal for the smallest laboratory use or the toughest plant piping job. In the larger sizes, up to 2" ID, TYGON Tubing has proved its worth in such uses as conveying chlorine from electrolytic cells to collecting heads, as permanent or temporary lines between pressure cylinders and mixing tanks, as inlet and outlet ports on pumps and filters, as syphon hoses, as line desurgers, and as flexible connections. For use at constant pressures of 40-250 psi, and at elevated temperatures, braided jacket reinforcement is available and suggested.

As molded goods, TYGON has a wide scope of application and, in general, exhibits the same resistance to chlorine as the extruded form. Specific pressure and temperature limits will depend on the size and design of the piece, but usually are greater than those for the other forms.

Typical uses of molded TYGON include gaskets, grommets, washers, stoppers, closures, handles, bumpers and special fittings. Where desired, molded TYGON can be reinforced with glass fibers for added strength.

As a coating, TYGON takes the forms of a solvent type paint and a plastisol (TYGOFLEX). Both forms are resistant to the fumes and spillage of chlorine and its solutions in any concentration and at temperatures up to 200° F. for the paint and 250° F. for the plastisol. Naturally, care in application is important and special consideration should be given to the limits of a thin film.

When used as a paint, TYGON affords excellent protection to all types of equipment, to structural steel, to walls, and to ceilings. For mild environments, a primer and no less than two finish coats should be used. For severe exposures, a minimum of five coats over the primer is advised.

For a heavier duty coating, TYGOFLEX can be applied by spraying on hot metal and, then, fusing with heat. TYGOFLEX is also used to cast or "slush" mold flexible parts and fittings and to cover intricate shapes by dipping.

In any of its forms, TYGON provides low cost protection and a high degree of safety in the handling of chlorine and many other chemicals including acids, alkalies, oils, and greases. The different forms available and the range of mechanical, physical, and chemical properties they exhibit, permit the proper use of TYGON in many applications and under a wide variety of conditions.

TYGON plastics

In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling chlorine in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain, acid proof brick and cements, and other organic linings and coatings.

Why don't you submit your corrosion problem, today? There's no obligation and we'll be pleased to be of assistance. So write, now! 28c

THE UNITED STATES STONEWARE CO., Akron 9, Ohio

ENGINEERS, MANUFACTURERS, ERECTORS OF CORROSION-RESISTANT EQUIPMENT SINCE 1865

THE Chementator

Reg. U.S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Not enough steel for chemical expansion

Chemical industry is getting a better break in its allotment of structural steel for expansion in the first quarter of 1952 than it got in the fourth quarter of last year, when many projects had to be deferred. Even so, the industry is still not getting all the steel that it needs, and many projects will be delayed.

Of the 70,291 tons that it asked for, the chemical industry got only 32,733 tons or 46½ percent. A little more may come from the 8,781 tons allotted to textiles.

Chemical industry didn't do too badly, however. It ranked fourth among the five industrial expansion programs getting more than 85 percent of the structural steel allotted for plant construction during the first quarter. Steel, aircraft, machine tools and industrial equipment were ahead of chemicals, while aluminum, magnesium and other light metals trailed. Together, these five programs got 314,000 of the 360,000 tons allocated for industrial expansion. Steel industry got the biggest bite: nearly 140,000 tons.

Chemical industry and Congress

Chemical industry will have a hot time on Capitol Hill now that Congress has come back for its second session. With Treasury Secretary Snyder forecasting huge deficits, higher taxes, particularly on the incomes of individuals and corporations, will be sought. But it's unlikely taxes will be raised in an election year. In addition to the threat of higher taxes, the chemical industry will be embroiled in the battle on controls and will figure in congressional investigations.

CONTROLS—The Defense Production Act expires next June 30. The White House is pushing not only for revision of the Capehart pricing amendment but also for additional control authority.

Chemical industry will oppose repeal of the Capehart provision and plug for repeal of controls not absolutely necessary for mobilization preparedness.

INVESTIGATIONS—The "most investigative" Congress will fight hard to retain its title. In addition to the Lyndon B. Johnson committee investigating the defense effort, the Delaney committee on chemicals in foods will be closing its hearings, with the spotlight on the chemical industry. The Delaney committee's report will signal another move to amend the federal Food, Drug and Cosmetic Law.

A coming investigation by Senator Wiley will look into the doings of the Office of Alien Property. OAP controls the giant General Aniline & Film Corp. and a dozen other chemical companies. It's charged that top jobs in these firms are held by Administration faithfuls.

There will also be an investigation of communism in labor unions. This will touch the International Mine, Mill & Smelter Workers and other unions in the chemical field that have been charged with harboring Communists or following the Communist Party line.

U. S. rubber industry looks at year ahead

Rubber industry will operate near capacity in 1952 to meet demands for civilian and defense products. Sales should run about 6 percent ahead of the record-breaking 1951 total of $5 billion.

Aggregate output of natural and synthetic rubber will exceed U. S. ability to consume it. Total rubber consumption in the U. S. will reach an estimated 1,336,000 tons in 1952, an increase of 8 percent over 1951. Of this total, about 65 percent will be synthetic.

Certain kinds of synthetic rubber (GR-S) are already in surplus supply and the government plans to sell it to foreign consumers. OIT will license shipments abroad of 10,000 tons of GR-S in the first quarter of this year. RFC will sell GR-S to exporters for 26 c. a lb. at the plant. There's also a glut of natural latex.

The rubber stockpile, thinks President H. E. Humphreys, Jr., of U. S. Rubber, is now more than adequate for defense and the time has come for a completely free market in natural rubber. Government officials have not yet returned buying to private industry, but have intimated that a free market is not far off.

The government's decision to stop allocating GR-S may have come just in time to avert a limited shortage of tires in parts of the country next summer, reports Vice President James J. Newman of B. F. Goodrich. Now that NPA has eased restrictions, tire manufacturers should be able to produce at least 71 million passenger car tires in 1952, or 5 million more than last year. Civilian tire sales for 1952 are expected to total 88 million units, compared with 83 million in 1951.

Chemicals and plastics, increasingly important in the rubber industry, will continue to expand this year. Research on new compounds and new uses will be intensified.

Big increases are expected in government orders for tires, rubber gasoline tanks and other products used

in aircraft. Volume production is expected to continue on rubber treads for tank tracks.

When its expansion is completed, the U.S. rubber industry will be producing over a million tons of synthetic rubber a year, enough to meet military and civilian needs. This contrasts with the situation just 10 years ago at the time of Pearl Harbor, when the United States was almost completely dependent on sources half way round the world for its rubber.

Atomic energy expansion

The Atomic Energy Commission and the Department of Defense are at work on plans for a third phase in the expansion of atomic energy production capacity, Chairman Gordon Dean of AEC has disclosed. Billions of dollars will be spent for new construction.

The move comes even before full impact of the second phase or current program has been felt. Biggest items in the current expansion are a huge plant at Aiken, S. C., which eventually will cost more than $1.25 billion, and a new $500 million plant at Paducah, Ky. These plants are part of the hydrogen bomb project.

Earlier, the first phase of atomic energy expansion had involved mainly a $300 million addition at the Hanford, Wash., plutonium plant and a $220 million expansion at the Oak Ridge, Tenn., separation plant.

How big will the planned third phase of expansion be? "Physically, we will be expanding an industrial and scientific enterprise," says AEC Chairman Dean, "in which the capital investment already amounts to something like $2,500 million and in which this investment will climb to around $5,000 million on the basis of the expansion program already under way."

Nitric acid from the atmosphere

The Army has authorized Food Machinery & Chemical Corp. to build a new plant at the Sunflower Ordnance Works in Kansas that will produce 40 tons per day of 100 percent nitric acid by direct oxidation of atmospheric nitrogen. Food Machinery has been turning out a ton of 60 percent acid per day at its San Jose, Calif., pilot plant.

The process takes place in a gas-heated furnace with two separate beds of magnesium oxide pebbles. Air is preheated in one of the beds, then comes in contact with fuel gas. The gas, burning in the preheated air, gives a temperature of about 4,000 deg. F., at which about 2 percent of the nitrogen in the air is converted into nitric oxide. When the gases pass down through the other pebble bed, the magnesium oxide pebbles absorb the heat so quickly that the nitric oxide is "frozen" before it can revert to nitrogen and oxygen.

A recovery system converts the 2 percent of nitric oxide from the furnace into concentrated nitrogen dioxide. The nitrogen dioxide, in turn, is converted into nitric acid in water towers.

Wanted: more chemical engineers

Chemical industry has a big job cut out for itself if it is to get the chemical engineers, chemists and other technical men it urgently needs not only as replacements but to staff the new laboratories and plants it is building for defense. It must convince military planners, draft officials, college students, politicians and the public of the decisive part technical men have in strengthening U. S. defenses. If it fails to do this job, Vice President Ralph A. Connor of Rohm & Haas warned the MCA in New York recently, the limiting factor on chemical industry expansion may be, not taxes, but technical manpower.

Industry needs at least 30,000 engineers a year to sustain mobilization. In the peak years 1951 and 1952 as many as 95,000 are required to fill places in industry and the military services. Yet the supply is dwindling rapidly: from 52,000 in 1950, when most World War II veterans finished their training, to 38,000 in 1951, 23,000 in 1952, 18,000 in 1953, and possibly as few as 12,000 in 1954. Meantime, Russia is turning out engineers at a 50,000 a year clip.

Two factors explain the critical decline in engineering manpower: (1) the thinness of the current college crop (fewer children were born in the depression-ridden '30s); and (2) the mounting demands of the military for manpower.

The hard fact is that all young men are slated for two years of active duty and six years in the reserves, whether they put in their time before or after college. Men in their 20s who get deferred now, are liable for call until they're 35.

Successive deferments are harder and harder to get, even for experienced technical men in industry. Add to that the call-up of reservists, many of them engineers, and you have a tough situation. According to Director M. H. Trytten of the Office of Scientific Personnel in the National Research Council, as many as 35,000 reserve officers will be called up by the Army in the next two months.

For Hooker, new Midwest chlorine plant

A new $10 million plant to manufacture chlorine and caustic soda will be built at Montague, Mich., by Hooker Electrochemical Co. Output of the plant, expected to be in operation by the end of 1953, will go to industry in the Midwest.

A 200-acre brine field is part of the total plant area of over 400 acres. The brine field contains more than a million tons per acre of high-purity salt. One well has been completed, and others are to be drilled by the middle of next summer. Brine will be piped the short distance to the plant.

Natural gas discovered during the exploratory

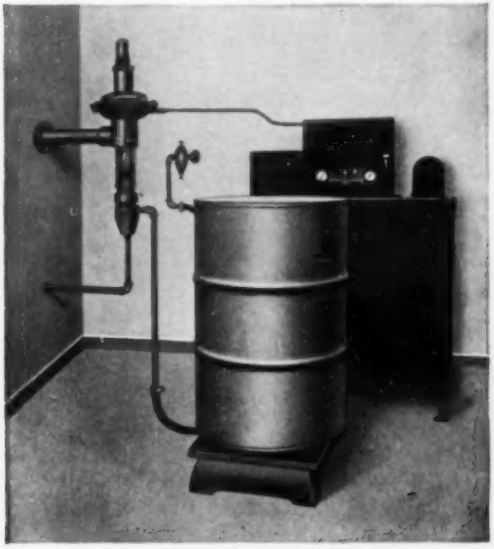
(*Continued on page 110*)

FEED PROCESS CHEMICALS

Continuously- Automatically- Accurately-

BY WEIGHT !

%Proportioneers, Inc.% new Weight-O-Matic Scale offers the process industries a simplified yet accurate method for feeding chemicals by weight in continuous process applications — either at constant rates or in response to process variables. Rates of feed are infinitely adjustable, from a few ounces to many pounds per minute. The chemicals may be injected into vacuum or pressure without affecting performance. This new scale comes in a wide range of capacities and uses the %Proportioneers% Loss-in-Weight principle. It may be equipped for automatic rebalancing and reloading and two Weight-O-Matics may be used in parallel for uninterrupted feeding.



%Proportioneers% Weight-O-Matic drum size automatic scale for loads up to 1,000 lbs. gross.

The Weight-O-Matic is ideally adapted for use in the laboratory or full scale plant production. Units can be supplied for feeding gases, liquids, or slurries. The scale tank can be pressurized or an eductor or gravity feed can be employed for discharging into flowing streams. Because the Weight-O-Matic responds only to weight demand, no correction factors for temperature changes need be applied. Volumetric calibration is also unnecessary. The feed is smooth, continuous, and without pulsation.

The Weight-O-Matic may be equipped with totalizers, recorders, and other accessories. The basic unit contains an alarm circuit which may be connected to a visible or audible alarm system to warn the operator of over- or under-feeding and inform him when the chemical reaches minimum and recharging is required.

Ask for Bulletins and Recommendations

% PROPORTIONEERS, INC. %

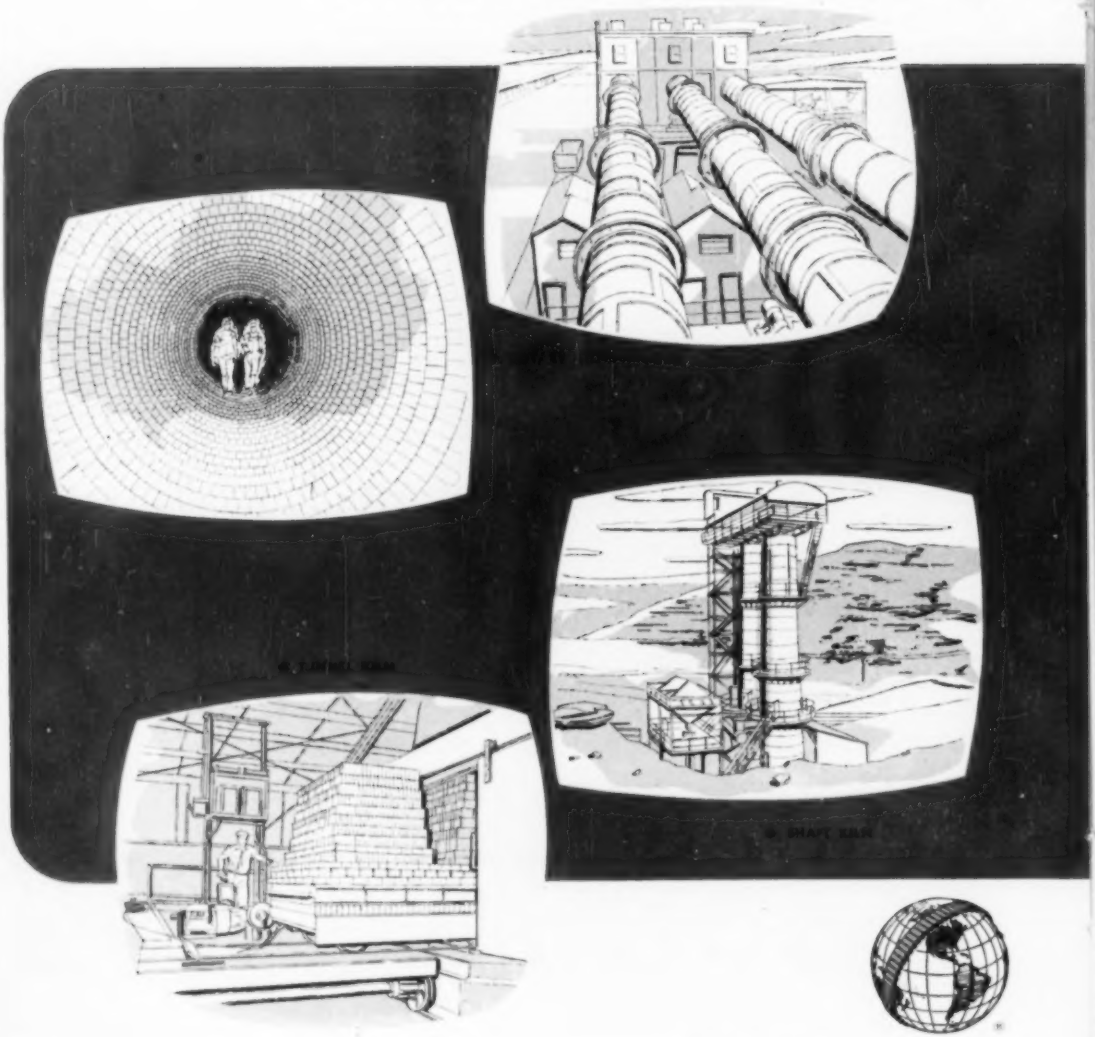
Write to %PROPORTIONEERS, INC.%, 369 Harris Ave., Providence 1, R. I.

Technical service representatives in principal cities of the United States, Canada, Mexico and other foreign countries.

Harbison-

THE WORLD'S
Most Complete
REFRACTORIES SERVICE

FOR EVERY Kiln

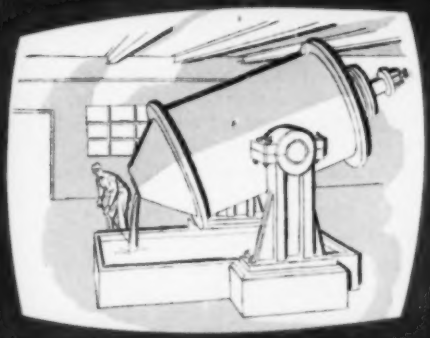


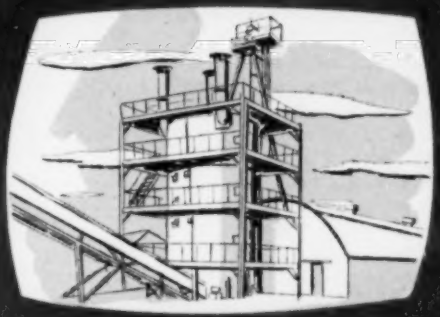
Walker REFRACTORIES

REQUIREMENT

For the widely varied conditions of service which kiln refractories must meet, no one class or type can be used with most economical results in all applications. Whatever the need may be for any type of kiln and for all operating conditions, involving calcination, clinkering, activation, catalysis, sintering or baking, Harbison-Walker provides the class and kind of refractory especially suited for the purpose.

Our Technical Service Department will be glad to assist in the selection of the refractories best suited for your particular need.





HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES
World's Largest Producer of Refractories
General Offices: Pittsburgh 22, Pa.

drilling may suffice to meet fuel requirements of the plant. Hooker will have first rights to its use. Water will come from nearby White Lake, and electric power will come from Muskegon, Mich., 14 mi. away. Eventually, deep water shipping from White Lake into Lake Michigan may be used.

Big Hooker Type S-3A electrolytic diaphragm cells will convert brine into chlorine, caustic and hydrogen. Each year, the plant will produce about 100,000 tons of all products.

Vinyl toluene replacing styrene

Vinyl toluene is now being substituted for styrene in the experimental commercial production of synthetic rubber at the Akron, Ohio, plant of Goodyear Tire & Rubber Co. In the new process butadiene is combined with vinyl toluene instead of styrene.

If the new process comes into widespread use it will free more styrene for the manufacture of plastics. Goodyear first explored the possibility of substituting vinyl toluene for styrene at the behest of RFC's Synthetic Rubber Division. Government vehicles equipped with tires made of rubber produced from vinyl toluene in Goodyear's pilot plant have come through road tests successfully.

The vinyl toluene is now being made in a pilot plant by Dow Chemical Co. Large-scale production is expected to start about the end of this year.

Back to work with back pay

An arbitration award cannot be used to deny an employee his rights under the Taft-Hartley Act. The National Labor Relations Board has set aside an arbitration decision and directed both the Monsanto Chemical Co., St. Louis, and the AFL Chemical Workers to reinstate, with back pay, an employee discharged for not paying union dues.

Although he had resigned from the union before the effective date of a maintenance of membership clause, the man was fired—on union demand—when he failed to pay dues by the date set by an arbitrator.

NLRB relied on a Supreme Court decision involving Consolidated Edison as grounds for disregarding the arbitration award. It ordered Monsanto to reinstate the worker with full seniority. The union must share in the cost of the back pay.

Mammoth petrochemical plant for Midwest

Work has started on the new $32 million plant of National Petro-Chemicals Corp. near Tuscola, Ill., which will recover ethane and other hydrocarbons from natural gas being carried through the Panhandle pipeline system and convert them into fuels and petrochemicals.

Recovery of ethane and other hydrocarbons will be carried out in the extraction and fractionation sections of the plant. It's expected that these, together with their storage facilities, will be in operation by October 1952. The chemical units of the plant for converting ethane into ethyl alcohol and ethyl chloride will be in production by the spring of 1953.

In addition to ethane, other valuable hydrocarbons will be stripped from the natural gas. Propane and butane will be marketed as liquefied petroleum gas. Isobutane, needed for the manufacture of aviation gasoline, will also be produced, as will a small amount of natural gasoline. Bulk of the new plant's production is already committed under long-term sales contracts.

The new facilities will tap only a small portion of the raw materials available. The plant has been designed so that the capacity of each unit can be doubled quickly and simply, with little or no interference with production.

Extracting and fractionating plants and general service facilities are to be constructed by J. F. Pritchard Co. of Kansas City, Mo., while the ethylene plant will be built by Lummus Co. of New York and the ethyl alcohol plant by Vulcan Copper & Supply Co.

Petro will construct a reservoir with a capacity of more than 100 million gallons to hold water pumped from the nearby Kaskaskia River. In periods of low water the supply will be augmented by pumping from wells near the river. Petro has also agreed to make channel improvements along 25 mi. of the river.

Plant design calls for the most modern and efficient waste disposal facilities. Waste water returned to neighboring streams will not cause pollution. Atmospheric contamination will also be completely avoided.

National Petro-Chemicals is owned 60 percent by National Distillers Products Corp. and 40 percent by Panhandle Eastern Pipe Line Co. Construction of the new plant, one of the largest of its kind in the world, marks the third expansion of National Distillers in the chemical field in less than two years. The first was the creation in 1949 of National Distillers Chemical Corp. to manufacture metallic sodium and chlorine. The second was the recent merging of U. S. Industrial Chemicals, Inc., into the corporation. National Petro-Chemicals, the latest venture, was organized last June.

Chemical employment at peak in California

California plants manufacturing chemicals and allied products are employing a record number of workers, according to the California State Division of Labor Statistics and Research.

An all-time high of 32,900 wage and salary workers are employed by California's chemical industry. That's an increase of 1,900 or 6 percent over a year ago. Prime factor in the rise: gains in plants manufacturing industrial chemicals.

Most of the additional workers are employed in the

(*Continued on page 112*)

Your Sole Source of All Forms ...All Grades...All Strengths

As a primary producer for over 50 years, General Chemical is known industry-wide for the uniformity and high quality of its Nitric Acid—*in any desired grade and strength...for any need.*

Thorough knowledge of the product and its properties recently led to General's development of the first Anhydrous Nitric Acid ever produced commercially. This, and the special fuming forms listed below, have varied and vital roles in today's urgent military and industrial programs.

For your Nitric needs, consult General Chemical... *industry's sole source of all forms!* Further information on any of the grades listed here may be obtained from the nearest General Chemical office serving you.

Nitric Acid

Grades of General Chemical Nitric Acid include:

ANHYDROUS

Total acidity 98.8% min.

FUMING

Fuming Red-Technical and Reagent, Sp. Gr. 1.59-1.60

Fuming White-Technical and Reagent, A.C.S., Sp. Gr. 1.49-1.50

COMMERCIAL

Standard—36°, 38°, 40°, and 42° Baume

Diamond (highest commercial quality)—36° 38°, 40°, and 42° Baume

Photo Engravers—36°, 38°, 40°, and 42° Baume

97% Diamond and Standard

REAGENT

Reagent, A.C.S., Sp. Gr. 1.42

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport Buffalo • Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) Houston • Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York Philadelphia • Pittsburgh • Providence • St. Louis • San Francisco • Seattle Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

Los Angeles metropolitan area. Los Angeles employs 15,000 chemical workers, 1,200 more than a year ago. In the San Francisco-Oakland metropolitan area, workers in chemical plants number 12,200, compared with 12,000 a year ago.

Production workers in California chemical plants earn a record average hourly wage of $1.82, 14 c. above the hourly average a year ago.

Another chemical plant at Edmonton?

A second major chemical plant, to cost more than $10 million, may be built at Edmonton, Alberta, where Canadian Chemical Co., Ltd., a Celanese Corp. of America affiliate, already is spending $54.6 million on a plant.

The second new project is being considered by Canadian Industries Ltd. Executives of the firm from Montreal have been in Edmonton conferring with officials on a site. The company has taken a five-month option on 300 acres about a mile east of the city.

Not enough hydrofluoric

Because demand for hydrofluoric acid is outrunning the supply by 10 percent, the NPA is readying a trio of orders designed to conserve hydrofluoric and restrict its use. They're expected to be issued early this year.

GROWING USES—Hydrofluoric acid has a wide range of growing industrial uses, chief of which may soon be the production of the new fluorochemicals. Some big current uses: refining aviation gasoline, pickling stainless steel, desanding castings, reclaiming aluminum, etching glass, refining rare metals, electroplating, making polyterpene resins and producing the Freon refrigerants and aerosol propellants. A shortage of hydrofluoric could hurt the infant fluorochemical industry.

THREEFOLD ACTION—What NPA is getting set to do is: (1) conserve 10,000 tons of acid-grade fluorspar in the hydrofluoric acid industry during 1952; (2) cut the amount of acid-grade fluorspar used by the glass and porcelain enamel industry by 50 percent; and (3) limit consumer inventories of acid-grade fluorspar to a 45-day supply.

NPA's decision to undertake this threefold action is backed by agencies responsible for the government's strategic stockpile. These agencies have already diverted acid-grade fluorspar from the stockpile for use in production of hydrofluoric acid, and will continue to do so through the first quarter of 1952.

DEMAND INCREASES—When spokesmen for General Chemical, Alcoa, Du Pont, Harshaw and Pennsalt, all vitally interested in the hydrofluoric situation, powwowed with NPA officials in Washington recently, NPA told them estimated 1952 requirements for anhydrous hydrofluoric acid tot up to 105 million pounds, while production is not expected to exceed 95 million pounds. Consumption of hydrofluoric rose from 73 million pounds in 1950 to an estimated 88 million last year.

WHAT'S BEHIND IT—The increased demand for hydrofluoric acid is largely due to programs of the Atomic Energy Commission and the Chemical Corps, together with increased use for the refining of aviation gasoline, rising demand for Freon and use in pickling stainless steel. Full impact of the new fluorochemical industry has yet to be felt.

U.S. deposits of fluorspar are probably adequate, although reserves of the acid grade aren't overwhelmingly abundant. However, expansion of mining and refining facilities has lagged behind fast-climbing demand. Current expansion now under way won't increase output until late this year, when a "fair" balance between supply and demand is expected. Meantime, NPA is all set to issue its three orders, may even curtail less essential civilian uses for hydrofluoric if necessary.

Du Pont plans big plant in Texas

Du Pont has options to buy close to 700 acres on the Neches River between Beaumont and Port Neches, Tex., for possible construction of a chemical plant. There's one hitch, however. The government holds an easement on part of the property where river channel dredgings are dumped. The government says it will cost $15,000 to lift the easement.

A plan to clear the river front property for purchase by Du Pont has reached the office of the Secretary of the Army in Washington. It calls for building of levees at a cost to the Beaumont navigation district of $15,000. This would aid in disposal of mud from the ship channel dredging operations. If Du Pont gets full claim to the land, it plans an initial investment of $100 million in a new plant that would employ a minimum of 2,000.

Cyanamid picks site near New Orleans

American Cyanamid will build a $48 million plant on the Mississippi River above New Orleans at Avondale. It will probably make acrylonitrile for use in synthetic fibers and possibly other related chemicals.

Pennsalt increasing ammonia capacity

At a cost of $2.2 million, Pennsalt will more than double capacity for production of anhydrous ammonia at its Wyandotte, Mich., plant. Construction will start early this year, and the expansion is slated for completion early in 1953.

The new unit will use the Casale process, a high-pressure system developed in Italy. Foster Wheeler Corp. will handle the engineering and construction. Part of the ammonia produced will be used to make ammonium chloride at Wyandotte.

—*End*

INDICATIVE OF PROGRESS...

Mathieson research and product development at

NIAGARA FALLS, N.Y.

Back of Mathieson's expanding service to American industry is a well-integrated program of research and product development. The growth and diversification of output at Mathieson's Niagara Falls plant, for example, is the result of skilled work in this field. First production, over 50 years ago, consisted only of caustic soda and bleaching powder. Today, stemming from the original electrolytic process, Mathieson is producing these essential chemicals:

Caustic Soda • Chlorine • Ammonia • HTH Hypochlorite Products • Sodium Chlorite Products • Sodium Methylate • Hydrazine Products • Benzene Hexachloride

Mathieson's research and development program has been expanded to all 16 strategically situated plants. Out of this program are coming many chemicals which may fit into your future production and marketing plans. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

MATHIESON
HEAVY CHEMICALS

Sulphuric Acid • Processed Sulphur • Soda Ash
Caustic Soda • Bicarbonate of Soda • Ammonia
Sodium Chlorite • Nitrate of Soda • Chlorine
Calcium Hypochlorite

Mathieson
CHEMICALS

9320

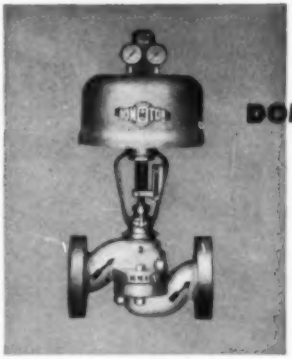
SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

Where Service Requirements demand the finest . . .

There you'll find ANNIN VALVES

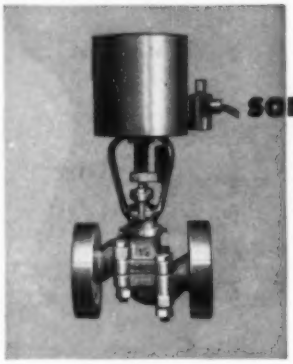
Valve Buyers, as well as instrumentation engineers are specifying ANNIN Valves for critical fluid control applications where valve performance must be accurate and dependable. New revolutionary principles provide an additional range of possibilities in working out instrumentation schemes. Although new and different to many valve users, Annin single seated Valves have been thoroughly time-tested and field-proven in thousands of applications in all phases of industry.

Superior performance at temperatures from −300° F to 1000° F and at pressures up to 3000 psi, plus lowered maintenance and inventory costs make ANNIN Valves first choice among valve users everywhere. It will pay you—in superior performance and lower operating costs—to investigate. Send today for Bulletin.



DOMOTOR

Precise control of hard-to-handle fluids. Powerful piston action combined with sensitivity and stability. Integral null type positioner eliminates external attachments.



SOLENOID

Piston actuated by pressure regulated by 3- or 4-way solenoid pilot valve. Powerful valve action by remote control. Fast shockless action in all types of service.

HANDWHEEL

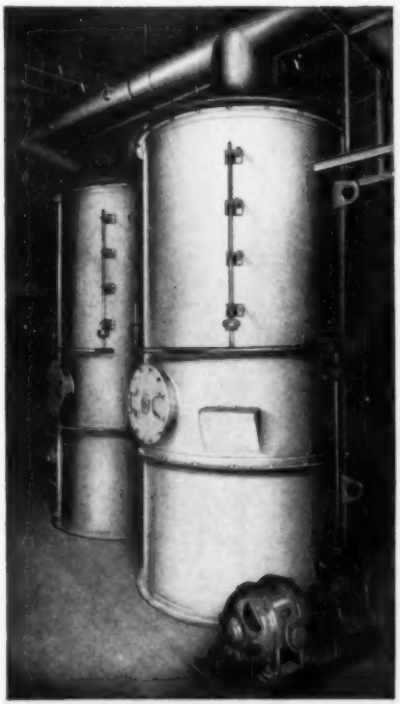
Valuable companion in shut-off service to the Domotor under same operating ranges. Interchangeable characterized trims make it valuable for batch and non-continuous fluid processing control.

REMEMBER—*Teflon Chevron packing has been standard equipment on all Annin Valves for over two years.*

THE ANNIN COMPANY • 3500 UNION PACIFIC AVENUE • LOS ANGELES 23, CALIFORNIA

DUST and FUME Control

Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air polluents



MAHON FOG-FILTERS AT WORK

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. PROBLEM: To eliminate H_2S odor from sulphonated grease manufacturing operations. The problem was complicated by grease and oil fumes present in H_2S gas. SOLUTION: A two-tower Fog-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution employed in the second tower and fogged at lower pressure removes the remaining H_2S from the air before it is exhausted into the atmosphere.

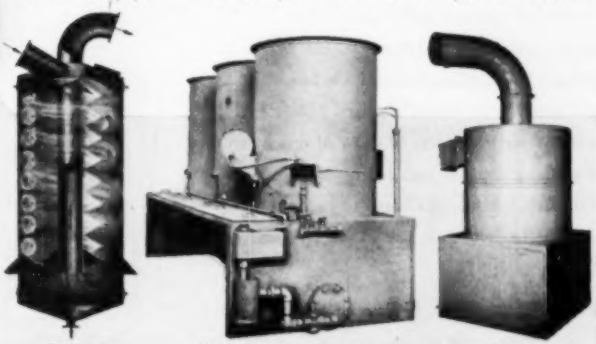
In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the polluent is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like polluents under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-652.

THE R. C. MAHON COMPANY

Main Plant and Home Office, Detroit 34, Michigan

Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.



Fog-Filter **Hydro-Foam Dust Collector** **Jet Trap Dust Collector**

MAHON

What might the Mings have done with Alcoa Alumina?

This priceless porcelain was produced during the Ming dynasty, a period which saw the science and art of Chinese ceramics reach their zenith. Yet what might the Ming technicians have produced had ALCOA Alumina been available 500 years ago?

PORCELAIN WINE JAR, MING DYNASTY, CHIA CHING PERIOD (1522-66)

Today's *successful* ceramic manufacturers have come a long way since the days of the Mings. By adding ALCOA Alumina to their mixes, they have improved the quality of their products in a number of ways. This highly inert, uniformly pure aluminum oxide makes their ceramics stronger . . . more resistant to heat and mechanical shock. It reduces firing deformation and lengthens the firing range . . . decreases quartz inversion and improves whiteness.

ALCOA Alumina gives *glazes* more impact resistance and increases color brilliance. It makes *glass* sparkle brighter.

Whether you make "modern Mings" or industrial ceramics, ALCOA Alumina can be of great value to you. Let us tell you how. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602A Gulf Building, Pittsburgh 19, Pa.

Alcoa Chemicals

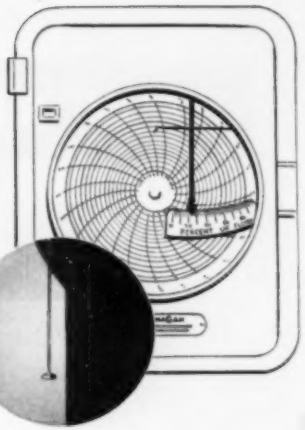
ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

One man can check a

HAGAN RING BALANCE METER!



He needs only a handful of check weights!

The check weight system for checking HAGAN *Ring Balance Meters is:*

The calibrated check weights supplied with each meter are stamped with the equivalent in inches of water differential. An easy calculation gives the relation between differential pressure and meter reading.

Here is all you do to check a Hagan Ring Balance Meter:

1. Simply close one shutoff valve and open the equalizing valve
2. Check the zero
3. Put check weights on ring assembly
4. Read pointer or pen position

Checking the Hagan Meter minimizes meter outage time. Sounds easy? It's just as easy as it sounds.

★ **ACCURATE**—check the Hagan Ring Balance Meter under full static pressure.

★ **CONVENIENT**—a handful of check weights does the trick—no cumbersome equipment.

★ **TIME—AND MONEY-SAVING**—only one man is needed, and he can check the Hagan Meter in a very few minutes.

For information about Hagan Ring Balance Meters and how they can work for you, write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTORQ FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

HAGAN
HALL
BUROMIN
CALGON

Hagan Corporation
Hagan Building
Pittsburgh 30, Pennsylvania

Please send me further information on Hagan Ring Balance Meters. I am particularly interested in _____

NAME _____

POSITION _____

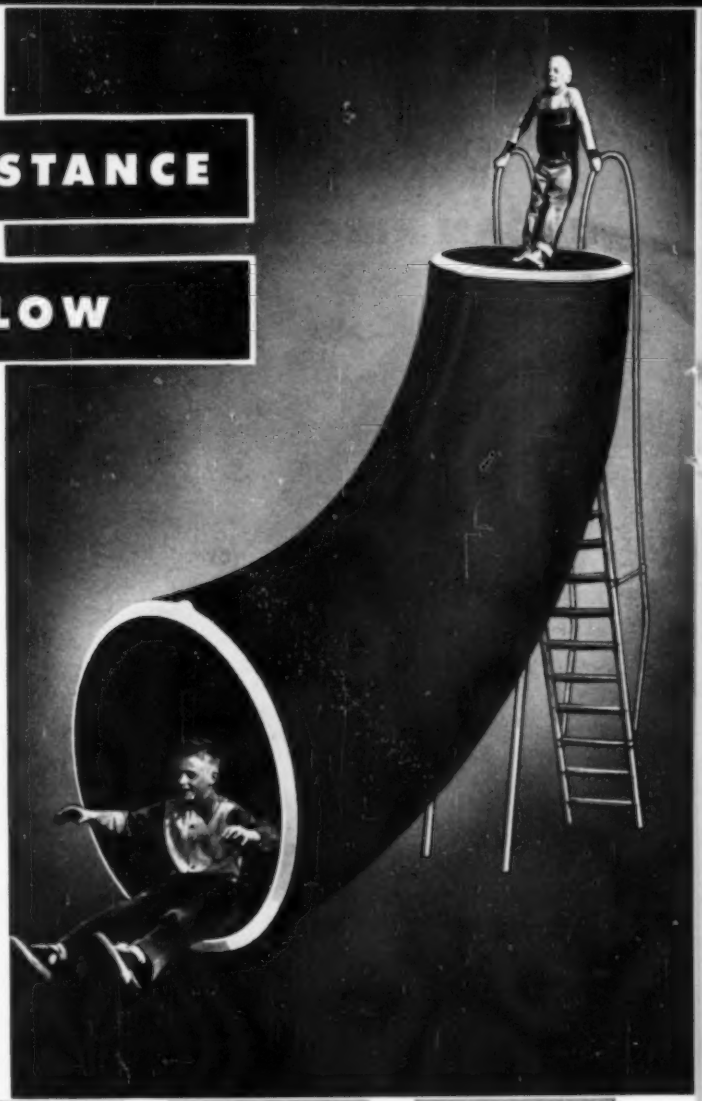
COMPANY _____

STREET AND NUMBER _____

CITY _____ ZONE _____ STATE _____

CE-1

LOW RESISTANCE to FLOW



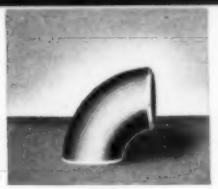
Minimum resistance to flow . . . that is the feature of Midwest Welding Fittings we call to your attention with this photographic fantasy. Other superior qualities that result from our unique manufacturing methods are dimensional accuracy and uniformity . . . true circular cross-section, controlled wall thickness, and accurate radius, included arc and tangents. The consequent benefits are a saving in welding time and a better piping system.

MIDWEST "LONG TANGENT"

Same radius as ASA but tangent equal to 25% of nominal pipe size on each end. Saves pipe, layout and welding time. Costs no more than ASA. Sizes to 24".

ASA STANDARD

Dimensions conform to applicable size range of American Standard for Butt-Welding Fittings, ASA B16.9. Tolerances much less than allowable. Sizes to 26".



SHORT RADIUS

Recommended where space limitations do not permit use of "Long Tangent" or ASA Elbows. Sizes to 30".

MIDWEST REDUCING

Takes the place of a straight size elbow and a reducer. Eliminates one weld, reduces pressure drop, easier to insulate. Sizes to 12", reductions to half size.

MIDWEST

PIPING & SUPPLY CO., Inc.

Main Office: 1401 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Pocasin, Los Angeles and Boston
Sales Offices: New York 7—90 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 13—520 Anderson St. • Houston 3—1313 Capitol Ave.
Tulsa 3—324 Wright Bldg. • Boston 37—426 First St.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

Build Fast at Low Cost with BUTLER BUILDINGS

Chemical plant at Memphis, Tenn., uses 50' x 100' x 14' Butler Building with modified center section.

This Butler Building is one of 12 used by chemical company at Military, Kans. Installation provides warehousing for 15,000 tons of sacked ammonium nitrate fertilizer.

Adaptable to the Needs of All Chemical Plants

Yes, you can build fast and at low cost with Butler Buildings. All over the country chemical processing plants are using Butler Buildings for new construction or expansion . . . for processing, packaging or storage facilities.

Butler Buildings give you these advantages:

1. Low cost . . . save up to 50% of the cost of conventional construction;
2. Erected in days instead of weeks;
3. Adaptable to your special needs;
4. Fire-safe, weathertight, wind resistant;
5. Low maintenance;
6. Long-life construction;
7. Wide range of sizes;
8. Easily insulated, and at low cost;
9. Proved in use for more than 40 years.

Straight Sidewalls . . . Use all the space you pay for.

BUTLER

BUTLER MANUFACTURING COMPANY

Kansas City, Mo.
Galesburg, Ill.
Richmond, Calif.
Birmingham, Ala.
Minneapolis, Minn.

For prompt reply, address Dept. CE-21 at office nearest you:
7338 E. 13th St., Kansas City 3E, Mo.
938 6th Ave., S. E., Minneapolis 14, Minn.
Richmond, Calif.

Send full information about Butler Buildings for use as _____

Send name of my nearest Butler dealer.

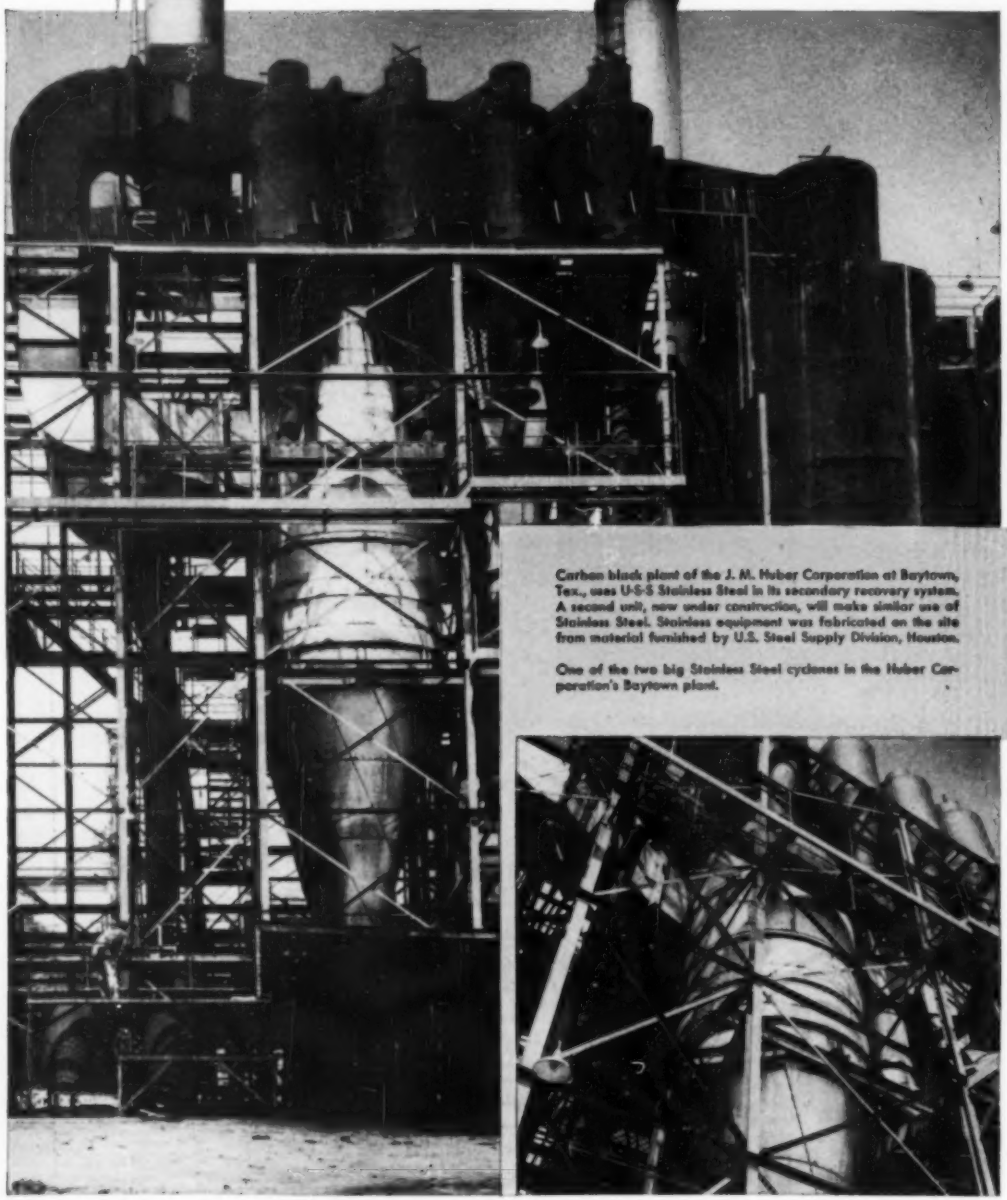
Name _____

Firm _____

Address _____

City _____ Zone ____ State _____

Carbon black slurry



Carbon black plant of the J. M. Huber Corporation at Baytown, Tex., uses U-S-S Stainless Steel in its secondary recovery system. A second unit, now under construction, will make similar use of Stainless Steel. Stainless equipment was fabricated on the site from material furnished by U.S. Steel Supply Division, Houston.

One of the two big Stainless Steel cyclones in the Huber Corporation's Baytown plant.

gives equipment the acid test ... and only Stainless Steel survives!

After only three weeks in service, the non-Stainless portion of this piping has been completely ruined by corrosive carbon black slurry, while the Stainless Steel section remains in good condition.

ONE GLANCE at this section of piping tells you why Stainless Steel was a must for the secondary recovery system in J. M. Huber Corporation's carbon black plant at Baytown, Texas. After only three weeks of service, the non-Stainless portion is completely eaten through, while the part made of Stainless Steel is relatively unaffected by the extreme corrosion.

In order to get maximum recovery of the carbon black produced in converters at this plant, the Huber Corporation installed a secondary recovery system. The secondary system includes dry and wet recovery, and it's in the wet end where corrosion takes its heaviest toll.

The Huber Corporation tested many types of materials, plus many different kinds of coatings, before selecting U·S·S Stainless Steel for wet recovery. Stainless Steel was used for the two cyclones—each 12 feet in diameter and 42 feet high—for the sprays inside the cyclones and the piping through which the corrosive slurry passes.

In this application, U·S·S Stainless Steel is subjected to sulfuric acid, carbonic acid and other acids. Temperatures range up to 180°. Stainless Steel is standing up under these conditions where other materials failed after two or three weeks' service at the most.

The severe service conditions under which chemical processing equipment operates often preclude the use of anything but Stainless Steel. Stainless Steel's resistance to high temperatures and extremely corrosive conditions, its strength with light weight and its freedom from product contamination mean long equipment life with less maintenance and less frequent replacement.

Some grades of Stainless Steel are in limited supply today, but essential needs are being filled. For finest performance, insist that your fabricator use perfected, service-tested U·S·S Stainless Steel.

U·S·S STAINLESS STEEL

2-119

USS

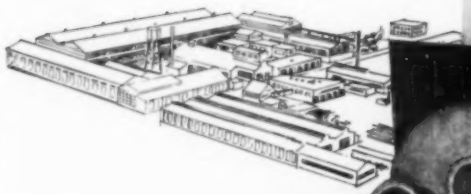
UNITED STATES STEEL COMPANY

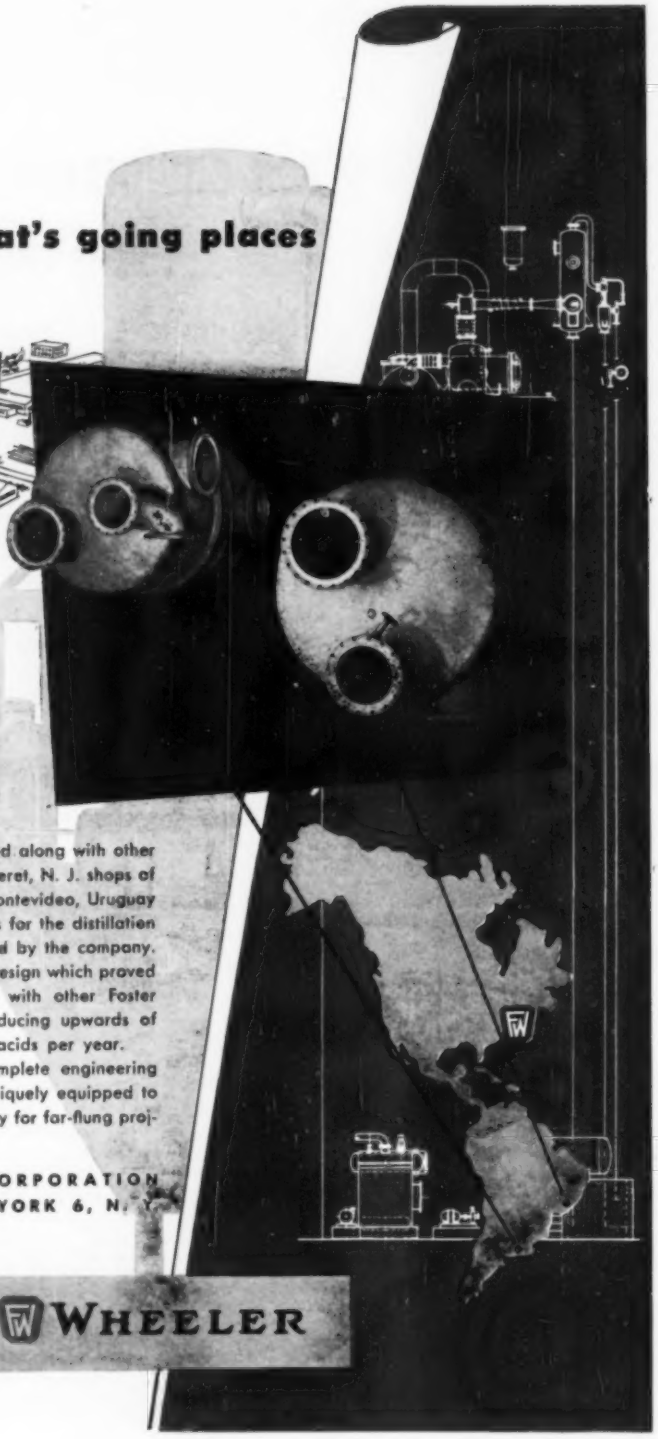
AMERICAN STEEL & WIRE .... COLUMBIA-GENEVA STEEL .... NATIONAL TUBE .... TENNESSEE COAL & IRON

UNITED STATES STEEL SUPPLY, WAREHOUSE DISTRIBUTORS .... Division of UNITED STATES STEEL COMPANY, PITTSBURGH

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

the design that's going places





FATTY ACID DISTILLATION

These stills have been fabricated along with other process components at the Carteret, N. J. shops of Foster Wheeler for export to Montevideo, Uruguay and Santos, Brazil where plants for the distillation of fatty acids are being erected by the company.

Both plants are based on a design which proved highly effective in connection with other Foster Wheeler installations now producing upwards of 150,000,000 pounds of fatty acids per year.

Foster Wheeler, with its complete engineering and construction services, is uniquely equipped to provide the overall responsibility for far-flung projects of this nature.

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

Leaving the STRESS where it belongs...

Stress relieving prefabricated piping with highly developed equipment and special techniques is one reason why exacting specifications are met with

GRINNELL PREFABRICATED PIPING

Grinnell received an order recently for stress relieving prefabricated piping to these specifications:—

> "All fabricated pieces shall be normalized and drawn by heating to a uniform temperature of 1700°F (plus or minus 25°F). This temperature shall be maintained on a basis of one-half hour for each quarter inch of wall thickness of the heaviest pipe in the furnace charge followed by air cooling not less than 600°F. All pieces shall then be reheated to 1425°F and held at temperatures as above. In no case shall the time be less than 2 hours . . . Cool at a controlled rate not to exceed 200°F per hour until 600°F is reached . . ."

Grinnell, of course, met these specifications precisely. In fact, fabricating industrial piping today demands the *maximum* in versatility and precision.

Modern power plants, for example, need piping of heavy cross-sectional area and definite alloy composition to provide high temperature stability, resistance to creep and graphitization. Chemical and oil refining processes, on the other hand, must have piping of high chrome alloy to impart strength at high temperatures, resist corrosion, withstand impacts at low temperatures. Heat-treating often is the only answer — either to restore properties affected during fabrication, or improve original properties.

GRINNELL'S AUTOMATIC HEAT-TREATING FURNACE

performs with positive efficiency. This versatile stress-relieving unit, measuring 12 by 12 by 40 feet and using gas or oil or both as fuel, was designed to give full program control for the entire range of working temperatures. It provides instrument control of rate of rise in temperature of the charge, length of time for holding at the predetermined temperature level, and cooling rate. Two recording controllers are provided for the furnace and a separate 6-point recorder registers the temperatures of the charge simultaneously during the treating cycle.

Exterior View of Building

In heat-treating, as in everything else for piping, Grinnell has the experience and the costly equipment to fully protect large piping expenditures. That is why it will always pay you to call on Grinnell for *all* of your piping needs.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

wherever you need stainless steel tubing...

TRY TRENTWELD!

● **Stock lines in food, paper, and chemical plants; heat exchanger units in processing industries; cooling coils in breweries, beverage industry, dairies and dairy equipment... throughout all industry, wherever there's a stainless or high alloy tubing application, there you'll find TRENTWELD.**

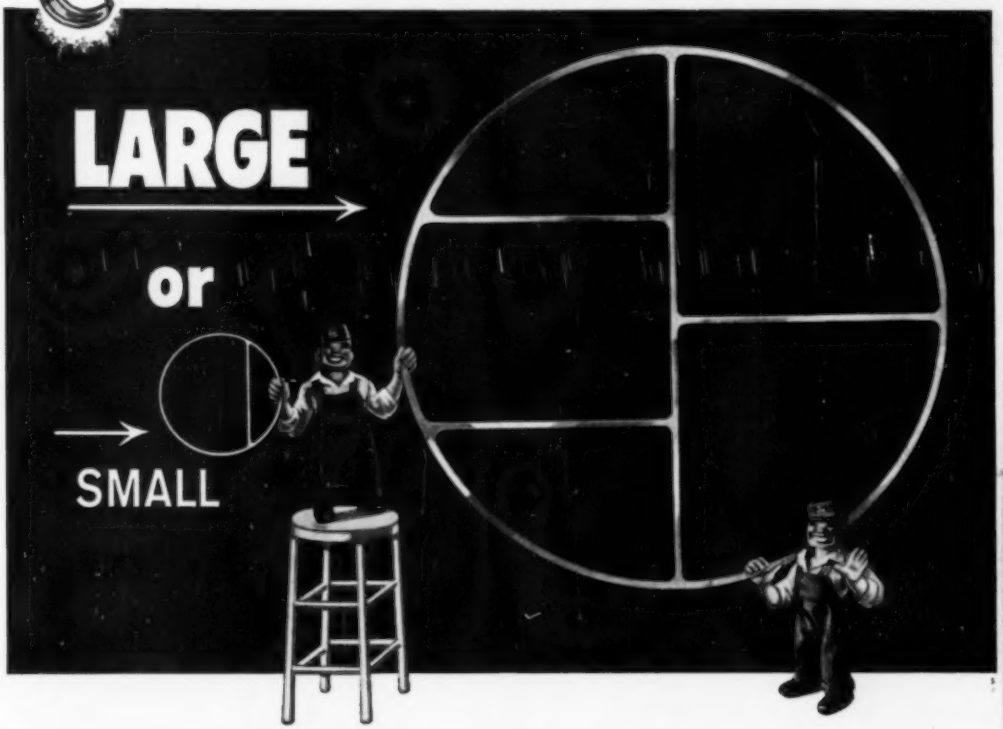
And it's to be expected! TRENTWELD is made in a tube mill by tube engineers who roll and weld stainless and high alloy tubing exclusively. Then too, TRENTWELD is available in a full range of sizes — 1/8" to 36" in diameter. This, coupled with Trent's convenient mid-continent location, means prompt delivery of what you want ... when you want it. If yours is a stainless or high alloy tubing requirement: Call on us.

TRENTWELD **STAINLESS STEEL TUBING**

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN

(Subsidiary of Crucible Steel Company of America)

Hand-tailored to any size you need...



...Goetze Heat Exchanger Gaskets are precision-made for longer service

Whether your requirements call for heat exchanger gaskets larger than 100" in diameter, or smaller than 10", you can get the exact size you want ... hand-tailored to the shape you need ... simply by specifying "Johns-Manville Goetze."

And because they're *precision-made*, you'll find these better gaskets provide the effective sealing and longer life that make them actually cost less in the long run. Each gasket is carefully constructed in every detail to assure accuracy of fit ... to provide ample lap widths and uniform rib widths ... and to prevent trouble-making wrinkles or cracks on the corners.

If you're having trouble with persistent joint leakage and frequent gasket replacements, find out how little it costs to have Goetze Heat Exchanger Gaskets tailored to your requirements. Your blueprint or template will bring a prompt estimate. Address Johns-Manville, Box 290, New York 16, New York.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE

INDUSTRY'S STANDARD STEAM DRIVE!

For Continuous or Stand-by Operation...

Here's the general-purpose turbine that meets the increasingly rigid demands of modern industry. It's the Westinghouse Type E, designed to operate reliably and efficiently where the going is tough. Regardless of operating conditions, the Type E is built to give trouble-free, economical performance for long periods of continuous operation . . . or instant operation when used as a stand-by drive.

Wrapped up in one reliable unit are the best features of all Westinghouse drives . . . plus refinements and development features which are now standard on all Type E Turbines.

Weatherproof bearing seals, corrosion-resisting gland zones, centerline support for freedom of expansion and contraction, dual protection against overspeed, floating movement of governing and trip linkages, and parts interchangeability between wheel sizes are among the many advantages built into Type E drives. J-50326

WRITE FOR THIS BOOKLET. We invite your comparison . . . *on any count.* See your nearby Westinghouse representative for the full story. Ask him for Type E Turbine Book B-3896, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

YOU CAN BE SURE.. IF IT'S
Westinghouse
TYPE E Turbines

BAKER PERKINS

Type "T" vacuum mixers give fast, efficient production of sanitary paper-coating compounds for food packaging at Marathon Corporation

In the food packaging industry, extreme care must be exercised to prevent any possibility of contamination of the packaging materials. That's why Marathon Corporation, Menasha, Wisconsin, uses Baker Perkins Type "T" Vacuum Mixers to produce the sanitary compounds that are used to coat papers for wrapping foods. One of these three-hundred gallon B-P Mixers at Marathon will handle a charge of 2000 lbs. and develop a maximum of about 100 h.p.

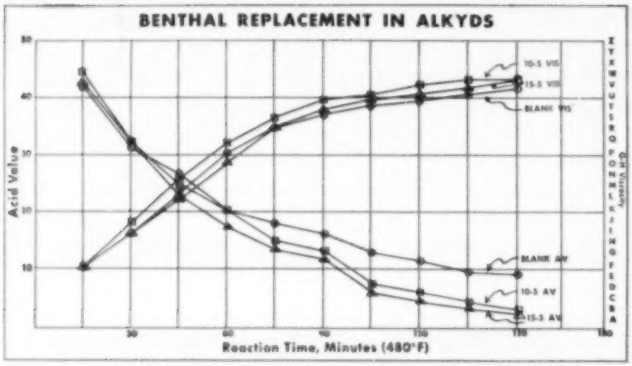
Baker Perkins makes a complete line of Vacuum Mixers for just about every processing operation. They will help speed production and improve the quality of your product. Write today for complete information.

BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION
SAGINAW, MICHIGAN

209

MONSANTO
CHEMICALS — PLASTICS



Phthalic anhydride shortage giving you trouble?

Here's how you can replace up to 10% of your phthalic anhydride with a combination of Benthal and maleic anhydride

If a shortage of phthalic anhydride is hindering your production, it will be worth your while to investigate Benthal.*

The chart above illustrates the Benthal-maleic anhydride performance compared to straight phthalic anhydride in a long oil formulation of the 52R 13 type. The following explains the graph:

In the Blank, 70.5 parts phthalic anhydride were used. In the 10-5 series, 10.5 parts by weight of phthalic anhydride were replaced with a combination of 7.1 parts Benthal and 3.5 parts maleic anhydride. In the 15-5 series, 14 parts phthalic anhydride were replaced by 10.5 parts Benthal and 3.5 parts maleic anhydride.

Fusion processed at 480° F. using agitation of 600 ft. per minute, peripheral speed, and 0.04 cu. ft. per min. of inert gas (CO_2) per gallon of batch. (Benthal and maleic anhydride added with the phthalic anhydride.)

Film Evaluation (0.5% Pb., 0.05 Co. on solids).

(1) Air Drying time

	MINUTES		
	Blank	10-5 series	15-5 series
Set to touch.	80	80	115
Dust Free..	100	100	150
Dry.....	270	270	300

(2) Reaction rate: about equal to Blank.

(3) Hardness: Blank and 10-5 series equal. 15-5 series, slightly softer.

(4) Alkali and water test: About equal.

(5) Durability: About equal.

This alkyd differs from a 52R 13 type only in that it has a lower phthalic content.

Write for literature on Sterox® detergents

Your request to the nearest Monsanto Sales Office or to Monsanto Chemical Company, Phosphate Division, 1700 So. Second Street, St. Louis 4, Missouri, will bring you any of the following pieces of literature.

Booklet—"Santomerse No. 1 All-purpose wetting agent and detergent."

Technical Bulletin P-123—Describing Santomerse D, Santomerse S, Santomerse No. 3 and Santomerse No. 3 Paste.

Technical Bulletin P-129—Describing the properties and uses of Sterox® CD.

Technical Bulletin P-133—Describing Sterox SE and Sterox SK.

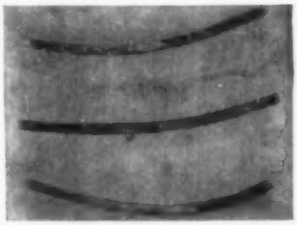
Technical Bulletin P-136—Describing Sterox No. 5 and Sterox No. 6.

Technical Bulletin P-122—Describing Detergent MXP.

Technical Bulletin P-142—Describing Emulsifiers H, L, M and R.

Technical Bulletin P-146—Covering the use of Santomerse S for metal processing in acid media.

Milmer 1 prevents mildew in polyvinyl chloride



Mildew destroyed this insulation.

Milmer 1 made this tubing mildew-resistant.

Such problems as mildewed shower curtains and embrittled insulation caused by fungus attack can be eliminated by the use of Monsanto Milmer® 1 (Copper 8-Quinolinolate-T).

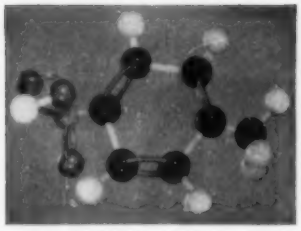
Milmer 1 prevents fungus deterioration of vinyls. Extensive military tests have shown that Milmer 1 affords vinyls superior protection from such attack.

Sometimes effects of fungi are visible on products made from vinyls. At other times the fungi may not be visible but the plastic loses its flexibility and cracks. These ill effects are due to fungi eating away the plasticizer.

Milmer 1 is practical to use in vinyls. Properly applied, it does not crock or bloom. It is nontoxic and permanent.

In addition to protecting scores of vinyl industrial products, Milmer 1 is an effective means of preventing fungus damage in paper, textiles and leather.

If you have the problem of fungi shortening the useful life of your product, investigate Milmer 1. Contact the nearest Monsanto Sales Office for technical assistance in the application of Milmer 1. Mail the coupon for a copy of Monsanto Progress Report, "*A guide to formulating and applying Milmer 1.*"

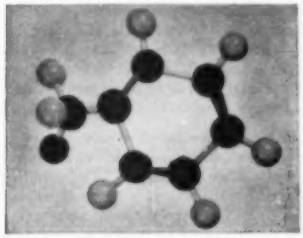


Toluenesulfonic Acid

You can get immediate delivery of toluenesulfonic acid from Monsanto. Toluenesulfonic acid is used as a dyestuff intermediate and as a catalyst in certain organic reactions.

Typical Analysis

Appearance and Color	Greenish to black viscous liquid or semicrystalline solid
Molecular Weight	172.20
Toluenesulfonic Acid	94.0% min.
H_2SO_4	1.0% max.
Water	2.0% max.
Toluene	0.2% max.
Para Isomer	80.0%
Ortho Isomer	20.0%



Benzyl Chloride

Benzyl chloride is a highly reactive aralkyl halide used in producing dyestuffs, perfume bases, acetate and other esters, plasticizers, resins, wetting agents, germicides, rubber accelerators, gasoline gum inhibitors, benzyl benzoate and various pharmaceuticals. Benzyl chloride is available for immediate shipment from Monsanto.

Typical Analysis

Appearance and Color	Clear to slightly turbid, colorless to yellow liquid
Molecular Weight	126.58
Specific Gravity at 15.5°/15.5° C.	1.105-1.110
Distillation Range:	
First Drop	177.5° C. min.
95% (1-96 ml)	3.0° C. max.
Dry Point	185.0° C. max.

SANTOMERSE* No. 1

the all-purpose detergent and wetting agent

COMBINES . . .

1. Surface Activity
2. Detergency
3. Wetting
4. Sudsing
5. Cleaning

TEAMWORK DOES IT!

To build a general-purpose cleaner, you need an all-purpose detergent and wetting agent. One that has a number of very desirable qualities—all equally effective—all working together—none overdeveloped at the expense of the others.

You need Santomerse No. 1!

Santomerse No. 1 is truly the modern all-purpose, synthetic, organic detergent and wetting agent. It possesses in unique and effective combination the following valuable properties—(1) Wetting Out, (2) Dispersing, (3) Emulsifying, (4) Penetrating, (5) Cleaning Action . . . It is also a fast, thorough rinser; holds dirt in suspension, floats it down the drain before it can be redeposited on cleaned surfaces. Prevents formation of insoluble curds.

Santomerse No. 1 functions very satisfactorily in hot or cold, hard or soft water, or in acid or alkaline solutions.

Free-flowing Santomerse No. 1 can be readily blended with other materials, has excellent bulking characteristics.

Typical products employing HB-40 as a co-plasticizer

HB-40

If you're interested in a plasticizer that helps reduce your cost and maintain your product quality, learn about HB-40 . . . It is a relatively nontoxic, high-boiling, colorless liquid that carries special interest as a low-cost plasticizer for Polystyrene Casting Resins, Polystyrene Adhesives, Molding Polyvinylcarbazole, Vinyl Extrusions, Vinyl Plastisols and Organosols, Vinyl Calendered Film and Sheeting, Ethylcellulose Injection Moldings, Strip Coatings for Metals, Floor Tile Compositions, Asphalt Base Paints . . . Available Now—Drums, Carloads.

Full information in Bulletin No. P-104.

AE-1

Some indicated uses for this NEW high-molecular-weight ALCOHOL ESTER . . .

1. Defoamer . . . 2. Co-plasticizer in rubber hydrochloride and chlorinated rubber . . . 3. Plasticizer for urea-formaldehyde resins . . . 4. Plasticizer for protein-film coatings . . . 5. Extender in aminoplast-alkyd systems . . . 6. Dispersion agent for pigments in vehicles and pebble-mill grinding of pigment pastes . . . 7. Resin modifier for asphalt and other bituminous compounds . . . 8. In printing inks . . . 9. Flow aid and lubricant for clay coating paper . . . 10. Wax modifier . . . 11. In detergents and softeners.

For more information, send for Technical Bulletin No. P-140. SAMPLES FURNISHED ON REQUEST.

• • • • • • • •

MONSANTO CHEMICAL COMPANY, 1700 So. Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto Canada Limited, Montreal.

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

SEND INFORMATION on prices, containers and shipping:

- ☐ Toluenesulfonic Acid.
- ☐ Benzyl Chloride. ☐ AE-1. ☐ HB-40.
- ☐ Santomerse No. 1. ☐ Benthal.

SEND LITERATURE:

- ☐ Progress Report (Milmer 1).
- ☐ Bulletin P-142 (Emulsifiers H, L, M and R).

MONSANTO CHEMICAL COMPANY
1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information or literature as indicated at the left.

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....

FACTS about the GLYCOLS

In times of shortages, steady profitable production is frequently endangered by the inability to get the proper raw materials. However, complete information about the various applications of chemical raw materials may help you use the materials currently in short supply in the most profitable manner. Despite today's shortages, Dow is also interested in helping you conduct experimental work with the glycols. Further research today may suggest new uses for the glycols, new ways in which they can serve you in future markets. For more information and technical assistance, write Dow using the coupon below.

The chemistry of the Glycols centers around the two hydroxyl groups which characterize them as glycols. They are intermediate in their properties between the alcohols with their single hydroxyl group and glycerine with its three hydroxyl groups. Like glycerine, the glycols are normally quite stable in air. At high temperatures, they tend to oxidize in air, giving rise to a wide variety of oxidation products such as aldehydes and acids. This oxidation can be reduced by the use of inhibitors so that the glycols can be used as heat transfer media.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Properties and Specifications of the Glycols

	Chemical Formula	Molecular Weight	Specific Gravity 25/25°C.	Freezing Point °F.	Boiling Point °F.	Flash Point °F.	Fire Point °F.
Ethylene Glycol	$HOCH_2CH_2OH$	62	1.112	7	390	241	257
Diethylene Glycol	$HOCH_2CH_2OCH_2CH_2OH$	106	1.116	15	475	275	293
Triethylene Glycol	$HOCH_2CH_2OCH_2CH_2OCH_2CH_2OH$	150	1.122	21	545	309	345
Propylene Glycol, Industrial	$CH_3CHOHCH_2OH$	76	1.036	(−80)*	369	210	216
Dipropylene Glycol	$HOC_3H_6OC_3H_6OH$	134	1.025	(−54)*	446	244	253

*Pour Point

SPECIFICATIONS

	Specific Gravity @25/25°C.	Boiling Range 760 mm. Hg 5 to 95%	Acidity, Max. (As Acetic Acid)	Water Max.	Color Apha Max.
Ethylene Glycol	1.112-1.115	194-200°C.	0.01%	0.5%	15
Diethylene Glycol	1.115-1.118	240-250°C.	0.01%	0.2%	—
Triethylene Glycol	1.121-1.125	275-295°C.	0.01%	0.1%	60
Propylene Glycol, Industrial	1.035-1.037	185-190°C.	0.005%	0.5%	10
Dipropylene Glycol	1.018-1.028	220-240°C.	0.01%	0.1%	20

This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.

SOLVENTS:

Glycols can be used to excellent advantage with materials which must be formulated with water, but which are not soluble in water. In this manner, Glycols can be used in cutting oils (soluble oils), textile lubricants, dry cleaning soaps, and industrial hand soaps to name a few applications. Glycols are used in the preparation of hydraulic fluids because of their solution compatibility, and in steam-set printing ink where the resins are dissolved in Glycols and precipitated by water or steam to set the ink.

Besides acting as solvents, Glycols offer stability and practicality because of their low volatility, high flash point, and favorable viscosity characteristics. For a better solvent, investigate the future role that Glycols can play in your production.

ANTIFREEZE AGENTS:

The Glycols are most well-known for their use in permanent-type automotive antifreeze, and they also give dependable protection to water-containing materials subject to low temperatures. Some common industrial examples are: water-base paints, cooling sprays, water-base hydraulic fluids, glass cleaners, de-icing compounds, cleaning compounds, sprinkling systems, radiant heating systems, and aircraft water supplies.

One of the family, Ethylene Glycol, is reacted with Nitric Acid to produce a lower freezing dynamite. Glycols can replace salt in cooling brines where they decrease the corrosion factor. Glycols added to gas well effluent prevent the water present from freezing on cooling when removing casing head gasoline.

HUMECTANTS:

Is the "drying out" of your product cutting into profits? If so, consider the future job that Glycols can do for you. The ability of the Glycols to absorb moisture out of the air can be put to profitable use to secure: longer freshness for cigarette tobacco, baked goods and food; softening agents for paper; dehumidifiers for air and other gases; protection against the drying out of print pastes in textile processes. Glycols can also be added to sizes to prevent flaking. Be sure to start your experimental work with Glycols today if your materials are liable to excessive drying out.

PLASTICIZERS:

For materials too brittle, Glycols are very effective as plasticizers. For example, by plasticizing the binder, Glycols add pliability and softness to composition cork sheets. They can be reacted with polybasic acids to give alkyd resins which are softer than corresponding ones made from glycerine. Other products which have been softened are moistureproof cellophane film, glues, some fibers and papers.

OTHER USES:

There are many examples of the versatility of the Glycols. Ethylene Glycol, for instance, in conjunction with Boric Acid and Ammonia is widely used in the manufacture of radio, radar, and television condensers: it is also used as a mold release fluid for asphalt grave vaults. Propylene and Triethylene Glycol, in vapor form, have been used in the control of air-borne bacteria. And, in some cases, the Glycols can be used as lubricants. Be prepared for future markets . . . start your experimental work with Glycols.

If you have a Glycols problem

WRITE DOW FOR INFORMATION AND TECHNICAL ASSISTANCE.

The Dow Chemical Company, Dept. OC-12A, Midland, Michigan

☐ **Please send me additional literature about the glycols.**

☐ **Please send _____ reprints of this advertisement.**

Name _____ Title _____

Company _____

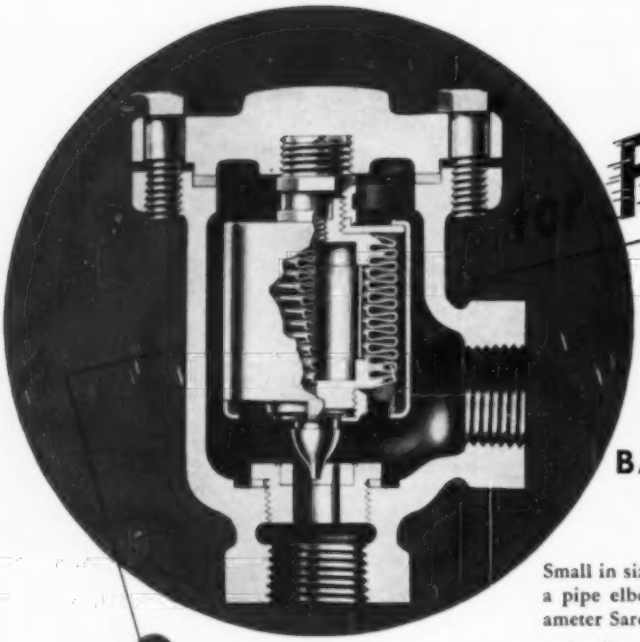
Address _____

City _____ State _____

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE



Sarco Thermostatic Steam Trap No. 9, available in sizes ½" to 2" for pressures to 300 psi. Bellows are phosphor bronze, monel or stainless steel as required, shielded from abrasion. Renewable valve heads and seats are of stainless steel.

FAST ACTION

use

SARCO

BALANCED PRESSURE THERMOSTATIC STEAM TRAPS

Small in size; light in weight, as easy to install as a pipe elbow, these new traps employ large diameter Sarco bellows proportioned to trap size.

Condensate only a few degrees below steam temperature snaps the large valve wide open. That means rapid and complete venting of air and non-condensables.

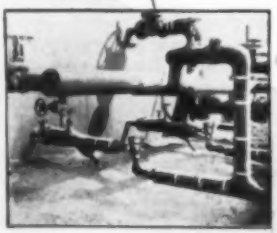
It means also exceptionally large condensate capacities.

Actually the balanced pressure type thermostatic trap has the highest discharge capacity per dollar cost.

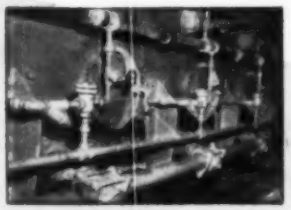
Other advantages: no seats to change when pressures change (fewer spares to carry); requires no protection against freezing.

WRITE for free copy of new catalog 256

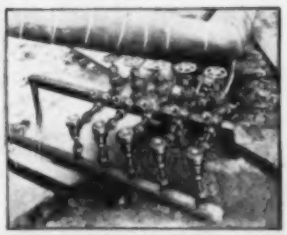
355



Sarco No. 9-225 traps and strainers draining steam heating coils in crude oil storage tanks.



Sarco No. 9-125 traps and strainers on bottle washer in brewery.



Sarco No. 9-300 traps and strainers removing air and condensate from steam tracer lines maintaining asphalt to storage tanks at pumping temperature.

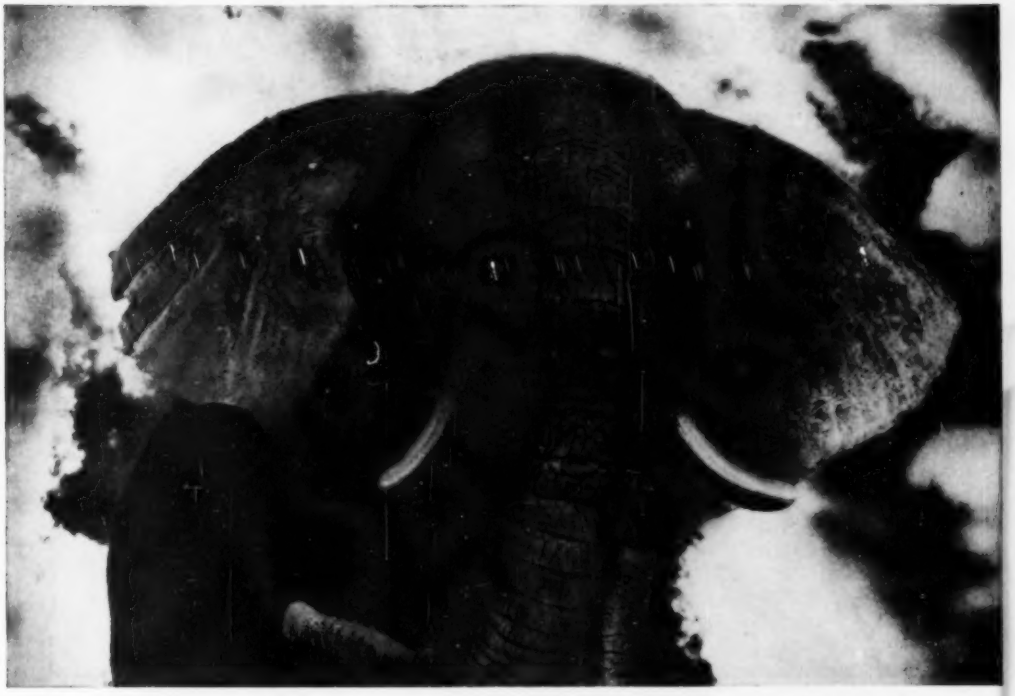
SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N.Y.

SARCO CANADA LTD., TORONTO 5, ONTARIO

REPRESENTED IN PRINCIPAL CITIES

You can't stop an elephant with a sling shot



You can't stop corrosion with ordinary paints...

it takes BITUMASTIC COATINGS!

CORROSION can't be stopped by ordinary paints or conventional protective coatings . . . they can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic® Coatings can!

FIRST – Unlike maintenance paints, Bitumastic Protective Coatings are specially formulated from a coal-tar pitch base* that is, for all practical purposes, impervious to water. And when you keep moisture away from an exposed surface, you *stop* corrosion.

SECOND—Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements — a barrier that is impenetrable.

THIRD—Bitumastic Coatings provide up to 8 times the film thickness of conventional paint coatings.

FOURTH —Bitumastic Coatings stop corrosion caused by moisture—acid fumes — alkaline fumes — corrosive soil—salt air—heat.

**Hi-Heat Gray contains heat-resistant metallic base.*

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

SEND FOR SET OF FREE BOOKLETS!

Koppers Company, Inc.
Tar Products Division
Dept. 156-T, Pittsburgh 19, Pa.

Please send me, without charge or obligation, your booklets on corrosion prevention.

Name.....

Address.....

City.....Zone...State.....

KOPPERS BITUMASTIC PROTECTIVE COATINGS

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 156-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

Here's Taylor's

1. Single knob adjustment of both proportional and reset control responses provides simple, quick stability "tune-in".

2. Change from direct to reverse action is made easily, quickly by rotating top plate without disturbing any pipe connections.

3. Plug-in manifold, with self-sealing valves, provides simple means for connecting or removing controller without disturbing pipe connections (optional).

4. Integral cut-off relay on every Bi-Act, permits panel or field mounting.

5. Cover plate protects control knob from elements, damage, and tampering.

New BI-ACT* CONTROLLER

Gives you single knob adjustment of both proportional and reset!

Here's a new, inexpensive force-balance controller incorporating a new control circuit. *One* stability knob adjusts *both* proportional and automatic reset responses. It's adaptable to practically any process . . . flow, pressure, liquid level and temperature . . . and particularly suited to applications requiring fast reset rates and broad proportional bands.

The BI-ACT CONTROLLER can be panel or field mounted. It can be changed from direct to reverse action and, with optional manifold, removed entirely without disturbing piping connections. SPECIFICATIONS: Gain 100 to .5 (Throttling range 1% to 200%) Automatic reset .1 to 120 repeats per minute. Size 7½" overall length. Standard operating range 3 to 15 psi. High capacity air valve.

This new BI-ACT CONTROLLER is the latest addition to Taylor's famous TRANSET* CONTROL SYSTEM, the new concept in pneumatic transmission control that is the talk of industry. Three component units, TRANSAIRE* TRANSMITTERS, TRI-ACT* or BI-ACT* CONTROLLERS and TRANSET* RECORDERS or INDICATORS, work together as a team to take full advantage of each others' superior performance in controlling practically any process variable.

For full details ask your Taylor Field Engineer, or write for Bulletin 98070. Taylor Instrument Companies, Rochester 1, N. Y., and Toronto, Canada.

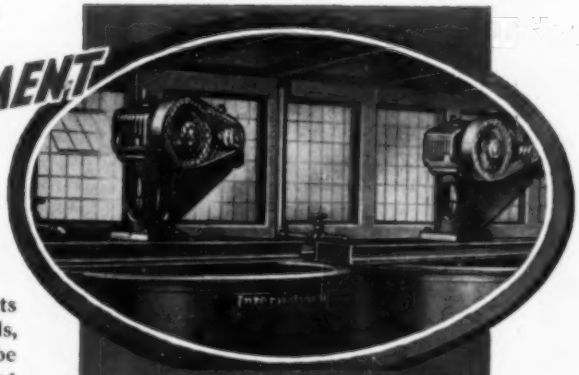
Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade-Mark

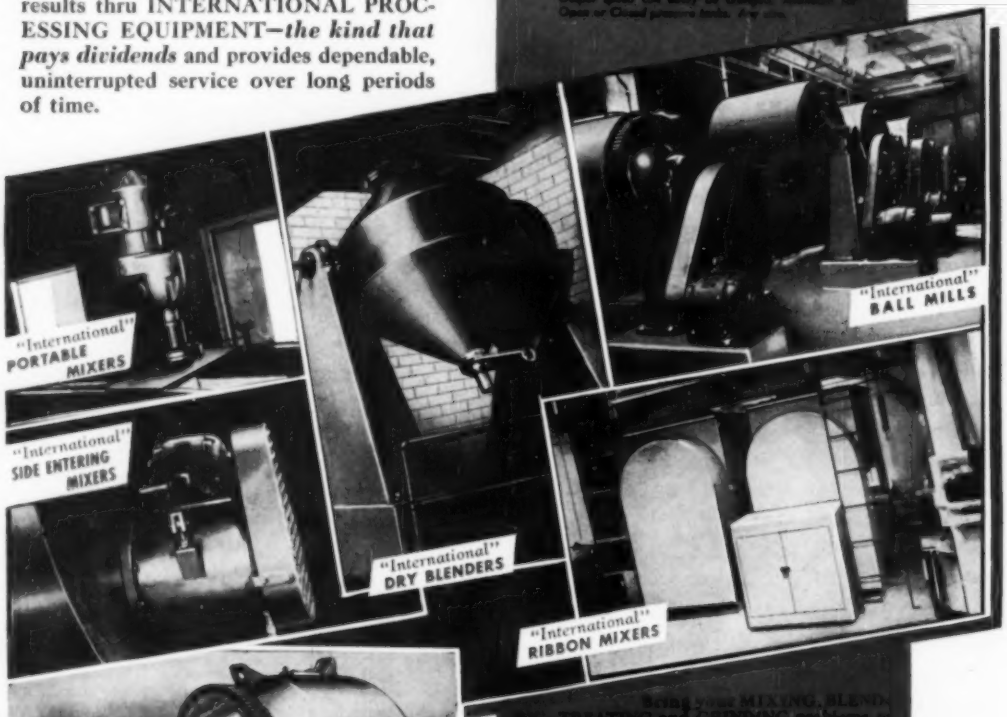
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

"International"

THE RIGHT EQUIPMENT For Every PROCESSING JOB



If your requirements include the Chemical Processing of solids, semi-solids or liquid materials, you can be sure of volume production and exacting results thru INTERNATIONAL PROCESSING EQUIPMENT—*the kind that pays dividends* and provides dependable, uninterrupted service over long periods of time.



International ENGINEERING, INC.

MFRS. OF CHEMICAL PROCESSING EQUIPMENT, VENTILATING FANS, STACK FANS, AXIAL BLOWERS, BRICK, TILE, POTTERY AND CERAMIC MACHINERY

They're the Winners!

We threw our little party on December 6, and it was a day of modest celebration at our New York office. And a day that'll be remembered best by two of our editors—Frances Arne and Dick Reeves.

These two editors—among the youngest of our staff—received the Kirkpatrick award for editorial effort beyond the call of duty ". . . through personal participation in the improvement of editorial design, construction and operation of *Chemical Engineering* magazine."

The award, sponsored by Sid Kirkpatrick since 1948, is given each year to an editor decided by staff vote; it's the highest honor the staff can give to one of its own members. This year the vote was a tie, so Frances and Dick had to divvy the honors.

The usual trappings went with the affair: a private luncheon, informal speeches—then certificates, cash awards, congratulations, photographers and flashbulbs, interviews with reporters from the McGraw-Hill Bulletin. Last came the petty payoffs, the turnover of cash that always follows betting on the winner.

You've already met Dick Reeves; I introduced him on this page exactly a year ago (Jan. 1951, p. 99). Dick has been with us for a little over a year now and has built up a solid reputation with our readers.

His You & Your Job department is already becoming one of the most popular sections of the magazine ". . . nothing stuff-shirt about it," one St. Louis admirer wrote in—which pretty well describes Dick himself.

And if you want other examples of Dick's readable, fast-moving style (he capped his chemical degree with a master's in journalism) you'll find them in this issue. The story on Pfizer's Terramycin (p. 145) is Dick's work. Then there's the news story on the cold sterilization of antibiotics by fission products (p. 228).

But rather than repeat the dirt I spilled last January on Dick, I'm going to tell you a little about co-winner Frances Arne.

Frances is one of our most versatile editors. Since 1947, when she joined us after a stint with the Bell Telephone Laboratories, there's hardly been a section of CE that hasn't felt Frances' lively touch—and been the better for it.

Recently, though, Frances has been making a reputation with her items on new products and materials (beginning this month, re-named Product News, p 198). Right now, she's tracking down a couple of brand new products that she hopes to announce next month.

Frances also covers foreign developments. During the past few years she has built up a correspondence acquaintance with chemical engineers in practically every country (except Russia) in the world. She's now trailing leads on developments in Australia, Belgium, Germany and S. Africa.

Once last year she got so hot on the trail of what looked like a first-class development in metallurgy that she stirred up a minor commotion in London and New York. Only to have the whole thing fizzle into a premature rumor that never saw print.

Frances also turns out those human-interest Man-of-the-Month sketches we have every month (p 304, this issue). Whenever possible, she interviews the person herself:

"Have you ever tried to pry loose interesting trivia about a man's life right after he's won some big honor? Well, the main trouble is most of them are so modest they're embarrassed to talk about themselves at all. But I'm catching on to the little tricks, I am." And indeed she is!

A few weeks ago one engineer in Seattle told us he found our New Technical Literature section ". . . the easiest to use and the most sensible I've seen anywhere." That's Frances' work, too. And besides, she handles a healthy load of other departments, along with feature articles and process news.

Frances has a keen interest in literature ("classical and corny") as well as in chemical developments. It all started, it seems, when a high school teacher (a nun) urged her to major in home economics.

"The heck I will," Frances said and decided then and there she'd concentrate on literature. "Oh no, you don't," her father said, "you've got a lifetime to pick up literature and dabble in writing; but you can't pick up chemistry by yourself." That started a dual interest that has become keener with the years.

Frances got her chemistry degree from Rhode Island's Brown University in 1945. "I wanted to go far away, to Montana; my folks wanted me to pick a local college. We compromised and I went to Brown; I found it was conveniently far from home, after all."

After a short stint at Bell Telephone Laboratories (where she worked

(*Continued on page 260*)

RYERSON
Up-to-the-Minute Steel Service
. . . 110 Years Young
PRINCIPAL PRODUCTS
CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types: Inland 4-Way Safety Plate, etc.
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat-treated . . . Standard and aircraft quality
STAINLESS—Bars, plates, sheets, tubes, etc.
REINFORCING—Bars and accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For every kind of metal fabrication
JOSEPH T. RYERSON & SON, INC.
RYERSON STEEL
110 YEARS OF SERVICE
1842-1952
RYERSON STEEL-SERVICE PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI •
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES •

SIDNEY D. KIRKPATRICK, Editorial Director *JOHN R. CALLAHAM, Editor*

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

JANUARY 1952

Chemical Engineering's First Fifty Years

Soul searching is a favorite year-end occupation. To know where we're going, it helps to know where we've been. So it is appropriate that the profession of chemical engineering review the record of its journey over the years, the better to plot its future course. And to the editors and publishers of this magazine, that reviewing process is all the more pertinent because 1952 marks the fiftieth year of our publication.

Since our founding in Philadelphia in 1902 we have seen chemical engineering grow from a mere hybrid of chemistry and mechanical engineering until today it is recognized as a major branch of the engineering profession. Greatest growth came between the two world wars. Much of this was catalyzed by the unit operations concept, first introduced in the educational programs at the Massachusetts Institute of Technology and the University of Michigan and soon reflected in the Chemical Engineering Series of text and reference books. Simultaneously, the unit operations and unit processes were popularized throughout industry, principally by this magazine and its predecessor "Chem. & Met."

More recently there has been a trend back to the underlying scientific principles of which the unit operations are but industrial applications. The appearance in 1948 of Kirkbride's "Chemical Engineering Fundamentals" marked the beginning of a revolutionary change that is certain to have a lasting effect on our profession.

Last month at the annual meeting of the American Institute of Chemical Engineers in Atlantic City, a distinguished panel led by Dean George Granger Brown of Michigan gave their answers to the question: "Whither chemical engineering as a science?" Discussion began with the premise that the "unit operations seem to be fast disintegrating as far as 'individuality' is concerned." But far from falling apart by disuse, they are actually "bursting at their seams." New applications of basic principles are being hailed as new unit operations so rapidly as to multiply and confuse the systematization of organized knowledge we call the "science" of chemical engineering.

The danger in this situation, as pointed out repeatedly by Professors Elgin, Pigford and Rushton is that we must avoid freezing our concepts into a rigid discipline which leaves no room for growth and development. The very fluidity of chemical engineering must continue to be one of its most distinguishing assets.

W. K. Lewis was quoted as having said long ago that a good chemical engineer is one who can handle any unexpected situation with confidence. His colleague, Dean Sherwood, also reminded us that despite all systematizing of knowledge, engineering must remain an art. "The scientist," he said, "solves only the problems that can be solved while the engineer solves those that must be solved." Mott Souders added the thought that we can systematize only what we know and have already applied—yet so much of our future lies in the unsystematized realm of the unknown. Hence the danger of crystallizing our concepts within the narrow confines of any arbitrary classification of unit operations and unit processes.

Such soul-searching discussions as those at Atlantic City have an encouraging portent for our profession. Chemical engineering's first fifty years may or may not have been our hardest. But they have taught us that our growth depends on our ability and capacity to apply the basic principles of our underlying sciences of chemistry and physics. Let us guard zealously our fundamental approach to the problems we face. Only in that way can we, as good chemical engineers, handle unexpected situations with confidence in ourselves and in the future of our profession.

Sidney D. Kirkpatrick

Fig. 1—From this panel the operator controls the slurry producing steps.

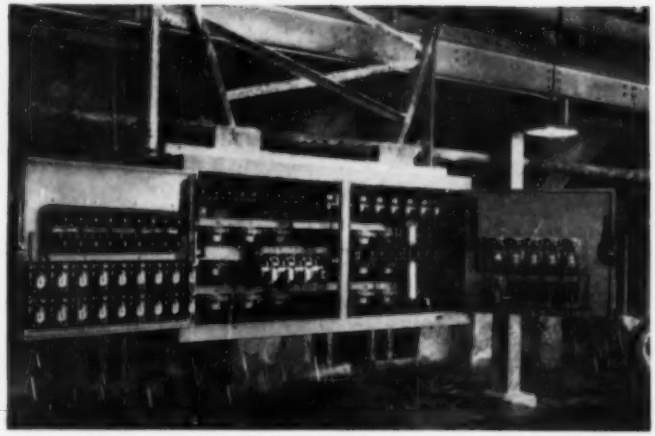


Fig. 2—Weigh larry control panel, opened to show mechanism, controls operations of the weigh larry, including filling, weighing out, and travel between stations.

Control Methods for a Batch Process

Ehret's new magnesia insulation plant contains many good ideas of use in control of batch processes. The plant successfully integrates remote manual control, automatic weight, materials handling and time cycle control.

THEODORE R. OLIVE

Desire to improve a batch process in which materials handling and accurate weighing played important parts was the problem faced by Ehret Magnesia Mfg. Co., Valley Forge, Pa., in 1949, when design of a new plant for 85 percent magnesia insulation was undertaken. As engineers and constructors on the project, the company chose and worked closely with The Kuljian Corp., of Philadelphia. Result of this collaboration was a process which, in its control phases, differs considerably from customary practice in the industry. The basic process is the recently developed precision self-set process (*Chem. Eng.*, Sept. 1951, p. 140) now used by a majority of producers in the industry. Therefore, the flowsheet (see *Chemical Engineering* Pictured Flowsheet, p. 208, Dec. 1951) is quite similar to that of other users of the process. However, it is with the control methods that this article deals.

To understand how both remote manual control and automatic control of weighing, materials handling and molding are accomplished, we must first sketch quickly through the process. Some magnesia insulation makers start with dolomite which must be burned, slaked and carbonated to separate out the soluble magnesium bicarbonate from the insoluble calcium carbonate, after which the magnesium bicarbonate is heated under controlled conditions to precipitate the normal carbonate. However, Ehret simplifies the chemical end of the process by starting with purchased sea-water magnesium oxide. The oxide is hydrated with cool water, then carbonated with clean CO_2 from stack gases to form the normal carbonate. The carbonate slurry is mixed by air agitation with long-fiber Canadian and African asbestos which has been partially opened by light milling in an attrition mill. Then the mixture is dewatered and washed on a rotary vacuum filter and repulped in cool water to form a slurry of about 75 percent water. This slurry is mixed thoroughly in rotating, tilting mixers, its density is adjusted, and it is then ready for preheating and molding.

During the foregoing stages there is some tendency for the normal carbonate to convert to the basic carbonate unless the temperature is held below 90 deg. F. The hydration of the magnesium oxide and the carbonation step are exothermic but temperature is controlled by limiting the amount of MgO used per batch and by starting with 55 deg. F. spring water which is available to the plant in large quantities. At the end of carbonation, temperature seldom exceeds 90 deg. F., and after filtration and repulping with cool water the slurry going to the mixers is about 70 deg. F.

From the mixers the slurry is distributed by an automatic weigh larry in accurately weighed amounts to a series of small preheaters. Like the mixers, these are also of the rotating, tilting type, but much smaller. In them the slurry is preheated for 5 min. with a controlled quantity of live steam to a temperature of about 140 deg. F. From this point on, operations must proceed rapidly since the slurry is beginning to develop its self-setting property. Immediately after heating, each preheater dumps its charge into the distributing hopper of one of the molding machines where

---

T. R. Olive, *Senior Associate Editor, has written on process instrumentation for many years. His next responsibility along those lines will be a special instrument issue in May.*

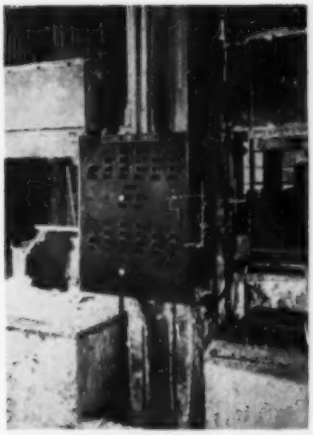


Fig. 3—Timer panel controls a pair of molding machines and their preheaters.

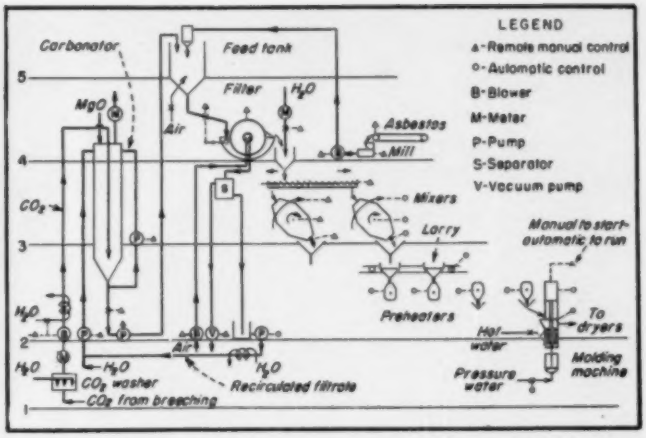


Fig. 4—Flow diagram of precision magnesia process through the molding step, showing which operations are manually, and which are automatically controlled.

both the cavity wall and the mold core are heated to 180-200 deg. F. by circulating hot water. Oscillating fingers lowered into the mold as the charge enters pack the slurry into the mold, orient the fibers and remove air bubbles. The fingers are withdrawn immediately, and after a few minutes at this temperature the conversion to basic carbonate is substantially complete. The molded tube or block of material, having become self-supporting, is pushed vertically from the mold cavity by a hydraulic plunger and placed by hand on a dryer car. Loaded cars are shuttled on a transfer car to positions in front of a steam-heated dryer, then pushed into the dryer a car at a time by a motor-operated pusher. The dryers use no more air than enters by leaks. The operating temperature is 400 deg. F., and drying is accomplished largely by the fan-recirculation of drying air through 300-lb. steam coils. Material to be dried initially contains 85 percent water. The dryer cycle is about 20 hr.

After cooling, the dried insulation is removed from the cars by hand, laid flat on an automatic conveyor and carried thus to band saws which trim the ends. Tubular pipe insulation passes through a second saw which splits it and it is then manually covered with pasted-on canvas, dried and packed by hand. Block insulation does not require covering. From the saw it feeds directly into cartons.

PROCESS CYCLE REQUIREMENTS

Design requirements of the plant are based on the molding process cycle and its slurry demand. The plant at present contains 14 molding machines with a maximum possible demand of 250 lb. of slurry per machine, or 3,500 lb. per cycle. Eventually, if the extra four machines are installed for which space is provided, this maximum demand will increase to 4,500 lb. per cycle. For average size products, the molding cycle is about 13 min., so that, allowing for contingencies, four complete cycles per hour are possible for each machine. This means a present hourly demand of about 10,000 lb. of slurry, or a future potential demand of about 13,000 lb. For particularly large molded pieces, which would require more than 13 min., the system provides a double-time cycle, with that mold being charged twice each hour.

In a system of this sort it is desirable to have the process paced automatically. The pacing element used here is the automatic weigh larry which has capacity to handle the entire slurry requirements of 18 machines for one cycle. Therefore, its two weigh hoppers normally handle 3,000-3,500 lb. of slurry at a time, but can handle a maximum of 5,000 lb. The slurry cycle timing allows for about four trips per hour.

This makes it desirable for the mixers which charge the larry, and for the carbonation tanks, to have capacities related to the larry capacity. Either of the two mixers is large enough to hold four larry loads, so that about one mixer load is used per hour. A normal carbonator batch likewise equals one mixer load or approximately 10,000 lb. of slurry, and the schedule therefore calls for about one carbonator cycle per hour.

SLURRY PREPARATION

The plant is laid out on five floors (Fig. 4) so that all movement is by gravity flow from the filter feed tank to the molds, thus avoiding any need for pumping slurry after the asbestos is added. Slurry preparation takes place on the fourth and fifth floors. The charging level of the eight carbonators (which are two-story high tanks) is on the fourth floor, where the filter and asbestos mill are also situated. This floor and the third where the slurry mixers are installed, is in charge of a single operator who, by centralized remote manual control (Fig. 1), is able without difficulty to handle the many operations in preparing the slurry, discharging it to the mixers, adjusting its final density in the mixers, then turning the mixers over to the automatic control system of the weigh larry.

The slurry batching operator has the following duties each hour:

1. He fills a carbonation tank with water, starting and stopping the second-floor water pump by pushbutton.

2. He starts the third floor recirculating pump by pushbutton, then charges the tank with eight bags of magnesium oxide totalling 640 lb.

3. He starts the second floor cycloidal CO_2 compressor by pushbutton. A solenoid switch in the compressor circuit turns on the water supply to the gas cooler and starts a small flow of corrosion-inhibiting oil to the compressor.

4. While the batch is being carbonated, the operator is engaged in other duties such as filtering an earlier batch, but for descriptive purposes it is easier to follow a single batch

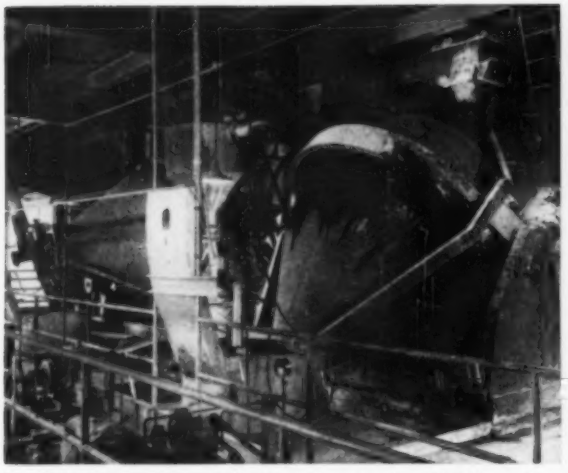


Fig. 5—In these mixers, which charge slurry to the weigh larry, the process shifts from manual to automatic control on finishing a batch.

Fig. 6—The weigh larry, heart of the process, distributes slurry automatically to preheaters.

through the process. As the end of carbonation is approached, the operator watches a CO_2 meter for rise in the CO_2 content of the vent gas. As completion is neared, he titrates samples, judges the end point, and shuts off the flow of CO_2.

5. Before a carbonator batch has been completed, the operator has loaded the required quantity of asbestos onto the asbestos mill feed belt.

6. A completed batch may be held in the carbonator until time for a charge to the filter feed tank. If its temperature tends to go too high, threatening conversion to the basic carbonate, it can be cooled by addition of cool water. When ready for the transfer, the operator shuts down the recirculating pump, opens the solenoid-controlled air-operated carbonator discharge valve on the second floor, starts the second-floor slurry pump and pumps the batch to the fifth-floor filter feed tank. While he is pumping, he starts a flow of agitating air to the filter feed tank and starts the asbestos mill and its feed belt and blower. The asbestos is transferred by the blower to a cyclone above the feed tank, dropping into it and mixing under air agitation with the normal carbonate slurry.

7. Preparatory to filtration of the batch, the operator shuts down the slurry pump and the asbestos mill and blower. Then he operates a selector switch for whichever of the two mixers on the third floor is empty, cutting it out of the weigh larry automatic control system and making it available for his manual control. A single reversible screw conveyor feeds from the filter to either of the two mixers (Fig. 5), its direction of rotation being interlocked with the mixer control so that when the operator starts it up, it must feed to the mixer which is now under his control. He tilts the mixer to receiving position, starts the feed screw, the filter, filter blower and vacuum pump on the second floor. He now opens a solenoid valve in the filter feed line which then goes under control of a float switch in the filter trough. As the filter cake begins to discharge, he opens a solenoid-valve-controlled water line which meters the water used for cake repulping. The meter is set to deliver somewhat less than the required water for repulping a batch.

When the entire batch has been filtered, the operator stops the filter, feed screw and associated equipment. He tilts the mixer to horizontal and starts it rotating. He can draw samples from the mixer without leaving the fourth floor, in order to check the density of the mixer contents. He adds the remaining water needed, completes the mixing, and stops the mixer rotation. The mixer is now filled with slurry of proper density and is ready to be turned over to the weigh larry control system when needed.

10. The weigh larry control system is designed to signal the batch operator when a mixer is empty. While the larry (Fig. 6) is taking on a charge from one of the mixers, a timer operates. If the full weight needed is not delivered during a predetermined time interval, a horn sounds on the fourth floor, warning the batch operator to switch his recently filled mixer over from manual to automatic control. He does this with the selector switch on his control panel. The weigh larry then automatically repositions under the full mixer and proceeds to complete its charge.

SLURRY DISTRIBUTION

Distribution of the slurry from the mixers to the preheaters and molding machines is accomplished automatically by the weigh larry, which is the most interesting part of the process. The larry (Fig. 6) is a small bridge crane operating above the mezzanine level on which the preheaters are situ-

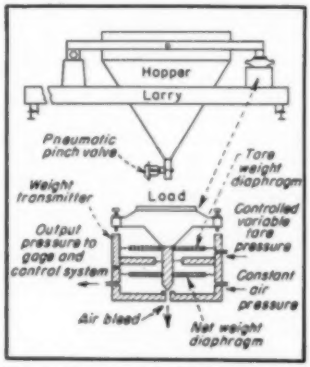


Fig. 7—Diagram of weigh larry and the pneumatic weight transmitter element.

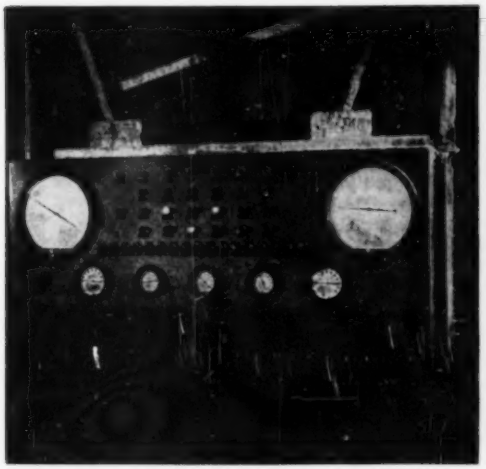


Fig. 8—Here is the front of the weigh larry control panel, suspended at working level. Note large net weight dials.

Fig. 9—Charging side of a molding machine with preheater hopper connected by rubber pipe to (elevated) mold hopper.

ated, and directly below the mixers on the third-floor level. It carries two conical hoppers suspended on pneumatic scales, each with a maximum capacity of 2,500 lb. of slurry. Under the present setup of 14 molding machines, the larry carries a charge of about 1,500 lb. per hopper and operates between 15 different positions or stations.

There are four filling positions: one for each hopper under Mixer (1) and one for each hopper under Mixer (2). After being filled, the larry waits for an automatic tare adjustment to a preset net weigh, to allow for slight inaccuracies in delivery from the mixer. There are seven discharging positions, one over each pair of preheaters, arranged so that two preheaters are charged simultaneously, and thus halving the normal charging cycle. Finally, there are two reversing positions at the ends of the larry track. At the second of these, that is, the empty end of the larry run, the larry waits under timer control for a second automatic tare adjustment which will be described later. In this position it automatically starts rotation of the mixer to be used for the next larry charge. After the larry has received its charge, rotation of the discharging mixer stops automatically so as to reduce wear and tear on the mixer, and also to reduce the tendency of the fiber in the slurry to "rope" due to too much working.

The larry control system, designed by Fluid Controls Co., of Philadelphia, is a combination pneumatic and electric system in which the weighing and tare adjustment are pneumatic, while the positioning is electrical. The control panel for the larry is suspended from it (Figs. 2 and 8), so as to be accessible from the second-floor operating level. The larry is driven from one station to the next by a reversible motor under control of a variety of electrical interlocks. For example, it cannot leave one station for charging the next pair of preheaters until the predetermined weight has been discharged. It cannot leave until the next pair of preheaters in the series has completed its own cycle and is in receiving position. It cannot leave a filling station under one of the mixers until a full charge has been taken on. The larry is reversed at the ends of its run by reversing limit switches, and is stopped at each preheater charging station by crane-mounted limit switches which strike solenoid baffles. As soon as the larry stops over a pair of preheaters, its two hopper discharge valves open, but only if the position is exact.

Since air under pressure is required for larry control, the larry carries its own air compressors and pressure tank. Each hopper is supported on a pair of arms pivoted at one end and carried at the other on a pneumatic weight transmitter of novel design (Fig. 7) in which the net weight of material in the hopper is exactly balanced by air pressure against a net weight diaphragm. To allow for the tare weight, which will vary from time to time, the pneumatic element also contains a tare weight diaphragm which can be pneumatically loaded to any desired pressure so as to support any part of the total load. Thus the tare weight is subtracted from the gross weight which would otherwise be indicated by the pressure output of the unit. Hence, this output represents only the desired net weight. The tare weight adjustment takes care of the weight of the hopper and any set-up slurry which may accumulate on it. It also compensates for any "heel" left in the hoppers after a preheater charging run. If any preheater station is out of service, or is to be bypassed on alternate runs by reason of a double-time cycle at that point, the tare pressure is built up at the bypassed station to show an apparent net weight delivery sufficient to allow the larry to proceed to the next preheater station.

Weights to be delivered to each preheater are individually adjustable. Also each preheater can be set to receive a charge on each trip of the larry, or on every other trip, or be bypassed entirely.

Fig. 7 illustrates the principle of the pneumatic weight transmitter. Regulated constant-pressure air is supplied to the net weight chamber and, by reason of the air bleed, exactly balances the portion of the load not carried by the tare weight diaphragm. The balance pressure is thus strictly linear with respect to the net load and is transmitted to the larry control panel. Here it is indicated on one of the two large dials appearing in Fig. 8. It is also communicated to a group of preset pressure switches (see Fig. 2) which control the quantities weighed into the two hoppers and weighed out

to the preheaters. The tare loading pressure is produced by a reversible motor-driven pressure regulator of the force-balance type.

Tare regulation is called for after the hoppers are filled, if any preheater is bypassed, and at the end of a preheater charging cycle. When the tare is to be changed, the tare regulator motor is controlled by the proper one of the previously mentioned preset pressure switches. To insure high accuracy, this regulator oscillates continuously through a small differential pressure range about the set control pressure.

Accuracy of the weighing cycle depends on the pressure switches, of which there is one for each preheater and each of the larry hoppers. These pressure switches are the large cylindrical units appearing within the box-like structure of the control panel in Fig. 2. They were specially designed for this installation and consist of a diaphragm operating a sensitive switch. One side of the diaphragm is exposed to the net weight pressure transmitted from the hopper scale, and the other to a preset loading pressure produced by a pressure regulator. The loading pressure set on each switch is the net weight to be met at the point in the cycle corresponding to that switch. Thus, the switches for the hoppers cut off and close the mixer air-operated diaphragm discharge valves when the hoppers have received the desired net weight. In the charging of the preheaters, their corresponding switches cut off and close the hopper discharge valves when the net weight pressure has fallen by the amount that the preheater is to receive. Over nearly a year of automatic operation, these switches have consistently remained within the specified accuracy of 1 lb. per mold maximum load of 250 lb.

Position of the larry in its cycle determines which of the pressure switches controls. For example, if Preheaters (1) and (2) have just been filled and the larry moved on, then the pressure switches for Preheaters (3) and (4) take over. Each preheater position is controlled by a manual three-position switch on the control panel which permits three options: (1) The preheater will be charged each cycle. In this case the pressure switch performs normally. (2) The preheater will be bypassed every other cycle. In this case a sequencing relay is cut in which allows normal operation on the first cycle, but raises the tare pressure on the second cycle, as already noted, so as to allow the larry to proceed to the next preheater station. (3) The preheater will be bypassed continually. In this case the tare weight will be adjusted every cycle. Finally, when the larry has reached the end of its run, it is necessary to readjust the tare to the actual weight of the hopper, not including any slurry it may contain. This remaining slurry may be due to initial overloading, or to the bypassing of one or more preheaters. At this point, on a timed cycle, the larry stops, the tare is adjusted to a predetermined value, and then the larry returns to the filling station under whichever mixer is to supply the next charge.

MOLDING CYCLE

Although all the operations of the weigh larry just described are fully automatic, they are under operator control to the extent that the molding cycle at each machine is started by the molding operator. The tie-in between the molding and larry cycles comes from the fact that the larry cannot discharge into a preheater until the preheater is ready for the charge. It is possible to control the molding cycle manually by means of pushbuttons on the mold timer control box located beside each pair of machines (see Fig. 3), but normal control is automatic with the various operations sequenced by a cycle-control clock. The operator selects whether manual or automatic control is to be used. When on automatic control, the operation does not start until the operator punches the button which starts the cycle controller. On the molding floor the only other manual operations include transferring the molded product to dryer cars, and pushing the cars to the entrance of the dryer. Three men handle these operations.

As we have seen, the mold cycle requires about 13 min., with an operating rate of about four complete cycles per hour for the 14 machines. At the end of the molding cycle for any molding machine the last operations are those needed to prepare a preheater charge for the next cycle. At a predetermined time after the larry has charged a pair of preheaters the cycle controller initiates the following actions: The preheaters tilt to horizontal position and start to rotate. A steam nozzle with a cover plate pivots under control of a pneumatic cylinder and enters the mouth of the preheater, so that the cover plate seals the opening. The steam then turns on for 5 min. as the preheater rotates, heating the contents to 140-150 deg. F.

Each molding machine is about three stories high. Running vertically in rails above the second floor level is the mold hoist which supports the mold hopper, an oscillating mechanism, and the oscillating fingers which lower into the mold to orient the fibers and remove occluded air. The top of the molds is set about 2 ft. above the second floor level. Molds of various sizes and types are interchangeable, the number installed in one machine depending on their size. For block insulation the mold is a rectangular cavity, but for pipe insulation it is a cylindrical cavity with a central core. The bottom of each type is closed with a carefully fitted plunger. All of the mold plungers on one machine are attached to a single hydraulic cylinder which lowers them to permit filling, or raises them to eject the solidified product. Both types of mold are hot-water-heated. Rectangular molds are simply suspended in the water-filled mold box, but cylindrical molds are individually jacketed, the jackets being in series with the water passages in the cores.

As soon as the operator starts the mold cycle controller, it sets in motion the operations needed to fill the molds. The plungers are already at the top of the molds from the last cycle and a charge is ready in the preheater. Now the hoist lowers the mold hopper to rest on the top of the molds. The hopper is connected by a flexible pipe (Fig. 9) to the hopper below the preheater. Then the preheater dumps automatically, after which it returns to vertical position ready to receive a new charge from the weigh larry. As the preheater dumps, the controller starts the descent of the plungers and of the oscillating fingers. When the plungers reach bottom the fingers automatically withdraw and the mold hopper rises out of the way of the operators. After enough time has elapsed for the product to set up at the mold temperature of 180-220 deg. F., the controller starts the rise of the plungers which thus eject the product. As the final operation of the automatic cycle, the preheater prepares a charge for the next cycle, as noted.

The plant also includes a number of other automatic features which, however, are fairly conventional in character. Among them are control of dryer performance, boiler operation, water treatment, mold water heating and the supply of hydraulic pressure for the mold plungers.

In acknowledgement we wish to thank R. M. Kinsey, general works manager of Ehret Magnesia Mfg. Co., as well as E. W. Winchester, project manager, and D. L. Allebach, project engineer, for The Kuljian Corp., for valuable assistance in supplying information and checking the manuscript.

Terramycin: From Dirt to Drug

How research led to a program of "screening the earth," uncovered a most important antibiotic. That spurred Pfizer to make chemical engineering history so that tonnages of the new drug could begin saving lives.

RICHARD V. REEVES

In 1947, Chas. Pfizer & Co. decided to make history—and then went out and made it.

We don't know exactly how it was decided, but a guess is that it began with a meeting of the Board of Directors, John Smith presiding. Carrying our bold guess a step farther, we would imagine President Smith told the Board that the war and an engineering skill dating back to citric acid and 1919 had hitched Pfizer's future to antibiotics. But, he probably told them, there were horizons broader than penicillin and streptomycin, that the only way to stay alive and grow in a field where today's Cinderella is tomorrow's second or third best, is through new and exclusive products and the bold venture that seeks them out of the earth where God put them.

Then he probably made his proposal: comb the 57 million square miles of earth for the miniscule miracle of nature, find a microorganism or two and multiply it in terms of tons. Only one thing was sure: it would probably cost millions. And the millions could be a total loss.

That was 1947. Everyone knows what the incumbent president, chemical engineer McKeen, told the Board four years later. Expanded research—the soil-screening—had cost close to $4 million and was worth every nickel. Pfizer was the world's leader in antibiotics. In a little more than four years, sales had more than doubled (1947—$39,215,281; 1951 about $100 million reported with terramycin looming as one contributory gain factor). Terramycin had reduced the number of death-dealing organisms by over 50. Newer uses were opening up every day. Latest to fall before terramycin was trachoma, the dread communicable disease of the eye that often results in blindness. And even more recent research indicates that the drug will be effective in fighting arthritis.

But marketing success—or even man triumphant over disease— is not the whole story of terramycin's development from a mold in the earth.

Part of this dramatic story hinges on the way a team of chemical engineers made terramycin production possible in record time. The rest of the story deals with the painstaking methods of soil screening.

After the green light flashed in '47, the search was on. It wasn't long before the little cellophane packets of dirt began to arrive in Brooklyn: by the thousands—from Africa, South America, Egypt, from missionary, airline pilot, explorer.

Next step was elimination. It begins with soil screening: 0.5 g. of soil sample is mixed with 50 cc. of water. After the suspension is thoroughly shaken, 0.5 cc. is drawn off the top, smeared on a Petri dish containing a jelly which favors the growth of most molds. After 4 days incubation in a warm room the colonies are developed. Most are immediately recognized by their familar colors: white yeasts, green penicillium, varicolored Actinomyces.

Unidentified colonies are plucked off and allowed further growth in a tube of nutrient jelly. After a week, the colony is transferred to a flask of broth for another period of incubation.

Then comes the bacteriological assay lab. Here cultures of different pathogens are tested with extremely dilute concentrations of the antibiotic substances produced by the molds. Some of the antibiotics are effective in dilutions as high as one part antibiotic in one hundred million parts of diluent.

Only about five percent of the molds shown any promising kind of antibiotic activity. And many of these never get to the pilot plant for one reason or another, usually because they just won't lend themselves to any kind of mass production technique. Many known antibiotic substances are "rediscovered." In searching for terramycin, Pfizer estimates that streptomycin was rediscovered 100 times.

Finally after 75 possible antibiotics failed to make the grade, a pinch of dirt from Indiana hit the jackpot and terramycin was found. That was about the middle of 1949.

But it was another thing to transform a trace into tonnages. That's where the chemical engineers came in.

By January 1950, they had a process in which terramycin could be extracted from filtered broth by *n* butanol. From this, the pure terramycin base could be recovered.

The process left much to be desired —partly from a not-too-favorable distribution coefficient and partly because too many steps were involved.

In February the process was scrapped. John McKeen told his engineers that Pfizer couldn't wait for a new plant to be set up. An extensive marketing program was in the works and they (the engineers) had six months to produce in volume. That meant the use of existing plant equipment which was designed for handling solid precipitates rather than solvent. Development engineers joined the production men and the race was on.

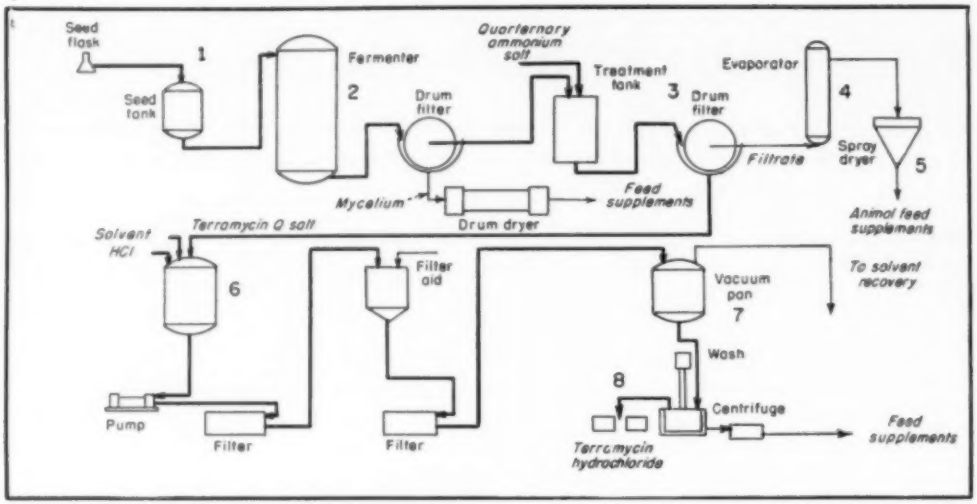
Then a brilliant young engineer came along. Working on his own he tried to improve the distribution of terramycin between butanol and fermentation broth by the use of various extraction agents. He tried quarternary ammonium salts. That did it!

But the Q salts gave a gummy mess. Ed Blase wrote a suggestion memorandum strongly urging a separate study of the precipitate. In the heat of the race it was ignored—so Blase went to work alone. After nights of sweat, trial and error, Blase converted the "gunk" to the yellow crystals of terramycin hydrochloride—understandably the company doesn't tell how. But they do say that the Blase innovation gave a pharmaceutical grade product and did it in fewer steps than any other recovery method proposed. And the entire development work had taken just a little more than half a year.

Result: it costs just a few pennies to save a human life

RICHARD V. REEVES, *assistant editor of Chemical Engineering, records the story of terramycin by Pfizer.*

For a Flowsheet of the Pfizer Process, See Next Page



How Pfizer Makes Terramycin

Process begins with a build-up of the culture. The medium containing selected nutrients to encourage fermentation, is sterilized by heating, cooled and introduced into vertically mounted cylindrical fermentation tanks. The air supply required for the fermentation is sterilized by special filters developed by the company. It is introduced through distributors located at the bottom of the fermentation tanks.

The inoculum, *Streptomyces rimosus*, is built up in stages from pure laboratory culture in smaller tanks, and finally introduced into the large tanks containing the sterilized medium. The sterile air is introduced into the broth by means of a pressure sparger in the base of the tank. A system of agitators, fixed to a central vertical shaft, keeps the mass in a turmoil and the result is growth at every level.

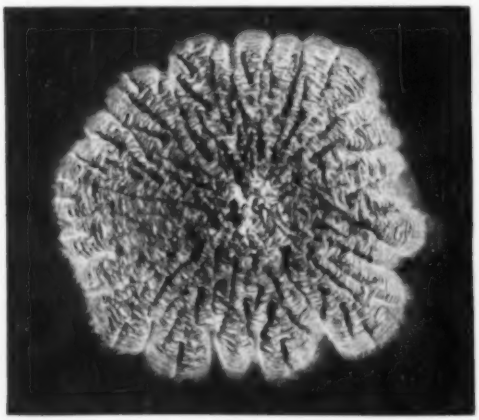
Capacity of the fermenters varies from 2,000 gal. for the pilot plant tanks in Brooklyn, to 25,000 gal. for some of the production tanks located at the plant in Groton, Conn.

The 2,000 gal. tanks, seeded with from 2 oz. to 5 gal. of pure culture, yield about 9 lb. of antibiotic minus a small recovery loss.

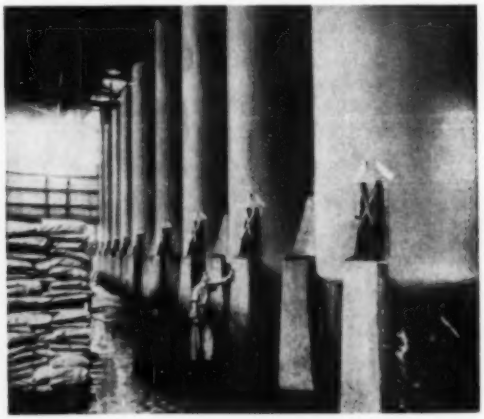
After the concentration of broth has reached a maximum value, usually after several days, the beer is filtered on continuous rotary precoat filters.

To remove the antibiotic, a long-chain quarternary ammonium chloride is added to the clear filtrate. This forms an insoluable Q-terramycin precipitate. This complex substance is recovered by a second filtration on rotary precoat filters and dried by warm air in cabinet-type dryers.

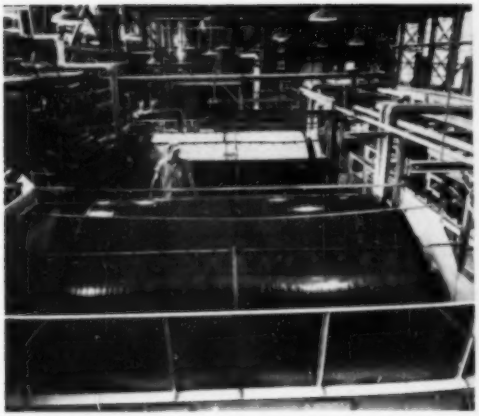
Dry Q-terramycin is then treated in glass-lined stirred reactors with methanolic hydrochloride acid. After removal of the filter-aid and other insoluble products, a crude grade of terramycin hydrochloride is recovered and recrystallized from a similar solvent system. This gives pure crystalline terramycin hydrochloride.



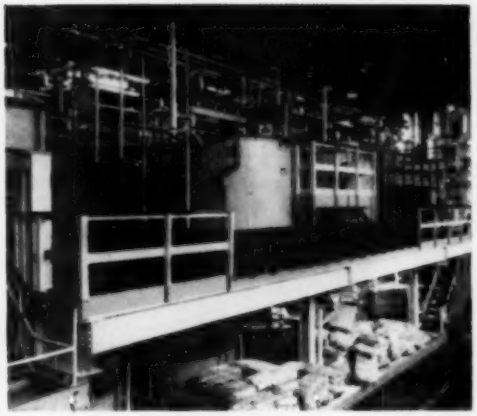
1. MOLD secretes antibiotics, is built up stagewise.



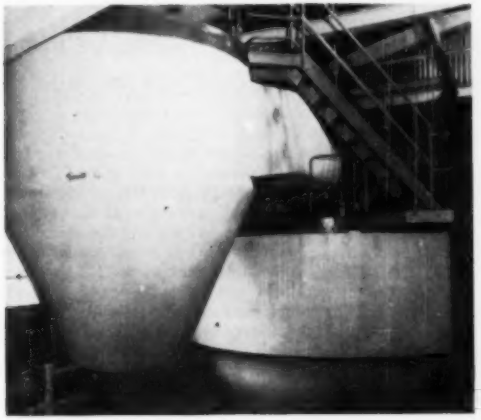
2. FERMENTATION: the key to biochemical engineering.



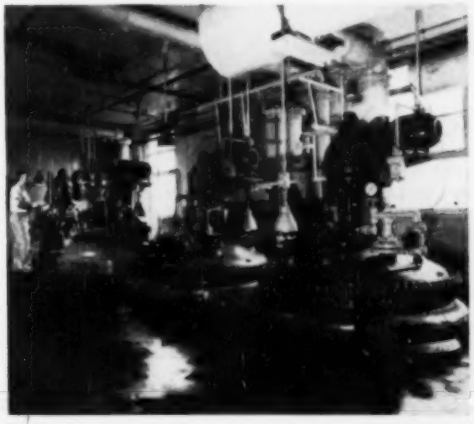
3. FILTRATION separates the mold from the broth.



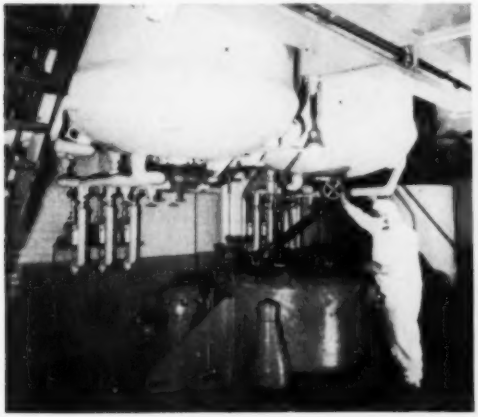
4. EVAPORATION helps process animal feed supplements.



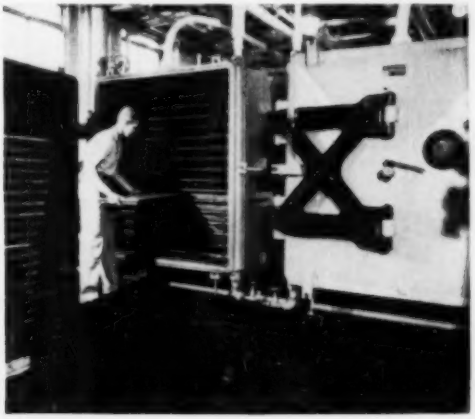
5. DRYING completes the processing of feed supplements.



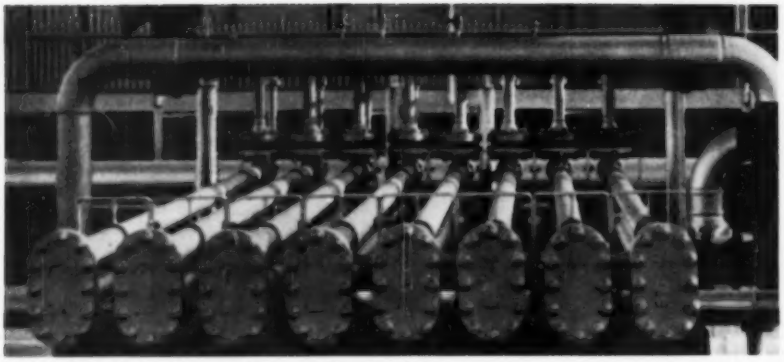
6. RECOVERY of medicinal product by means of Q-Salt.



7. CRYSTALLIZING, centrifuging done in sterile area.



8. DRYING in vacuum trays is the final processing step.



SECTIONAL heat exchange units are one form in which . . .

Finned Tubes Find Process Uses

Faster heat transfer, less fouling are major advantages of longitudinal finned tube exchangers.

L. C. JOHNSTON

Although extended surface heat exchangers have been used for many years in such services as steam heating of air or air cooling of water, their use in process applications to any large extent has assumed significance only in recent years. A major factor in accelerating this trend has been the commercial development of the longitudinal finned tube (LFT). This development has given the chemical engineer a versatile tool which he can adapt for many uses.

In spite of their wide acceptance in some fields, LFT exchangers are not suited for universal or indiscriminate use. This article points out their relative advantages and disadvantages, with the dual objects of preventing their misapplication where unsuited as well as encouraging their use where they are suited.

Two types of longitudinal finned tubes are currently available. One is made by cutting a groove along the axis of the tube, setting the fin into the groove and then mechanically bonding the raised edges of the grooved metal back to the fin, holding it in place. The other type is made by taking a flat strip of metal, forming it into a channel shape and then resistance welding the base of the strip to the tube. A variation of this is to silver solder or silver braze the channel strips to the tubes.

The suitability of LFT exchangers is governed largely by the comparative rates of heat transfer for the fluids under consideration. If there is an appreciable difference in the heat-transfer coefficients on either side of the tube, use of extended surface should be considered. A good index is a ratio between the two coefficients of 3 to 1. Any ratio higher than this would definitely indicate the use of extended surface.

Another consideration is the relative values of film coefficients and thermal conductivity of the fins themselves. With high film coefficients, the advantage of the extended surface, usually expressed as "fin efficiency," is not as great as it is with low film coefficients on the finned side. Use of highly conducting copper or brass fins, where permissible, will maintain maximum fin efficiencies.

Based on these factors, the greatest field of usefulness for LFT equipment, obviously, is transfer of heat from a thin liquid, such as water, or a condensing vapor, such as steam, to a viscous liquid, such as a middle or heavy petroleum fraction, or a concentrated solution, such as 50 percent caustic. There are, however, two other conditions under which finned tubes are useful: Where two fluids are of a similar nature but differ widely in their flow rates; and where a low heat density per unit of surface is required when handling heat-sensitive fluids.

The low heat density factor has been a big advantage in the heating of heavy oils and other organic fluids. Even at low flow rates, LFT heaters rarely give any trouble from coking or fouling on the tube surfaces.

A typical example is an LFT installation in which a heavy residual oil was put through on the finned side. After this unit had been in operation for almost 3 yr., the engineer in charge reported that it had never been taken apart for cleaning. It had been cleaned several times by steam and water, but no mechanical cleaning had been required. The unit was originally designed for an over-all coefficient of 12 Btu./(hr.) (sq. ft.) (deg. F.). Even after this length of time with no mechanical cleaning, the coefficient had dropped only slightly, to somewhere between 10 and 11. The shell-and-tube exchanger which had previously been used worked well right after cleaning, but in about 6 weeks fouled up so badly that the coefficient dropped from about 14 down to 7.

Similar results have been obtained when heating very heat-sensitive sugar solutions. Normally, sugar refiners have to watch their steam temperatures very carefully when using bare tube equipment. When using LFT equipment, however, they have found that higher steam temperatures can be used without burning or caramelizing the syrup.

The most popular item in the LFT field is the sectional heat exchanger. These units are extremely flexible and versatile. For any given service you can manifold them

L. C. JOHNSTON is *district sales manager of Brown Fintube Co., working out of New York.*

in any desired series and parallel combination. If the duty is increased, you can cut in more sections; if the duty is decreased, sections can be cut out.

The individual sections are comparatively light and are easily moved around. This means that if a process is shut down because of obsolescence or changing market conditions, the sections can be used anywhere else in the plant where they are needed, or even shipped to other plants.

Another advantage of a sectional installation is that you can bypass one section or one bank of sections at a time for cleaning, maintaining the rest of the unit on stream.

The LFT tank car heater was developed for unloading tank cars of heavy viscous materials when the cars had no coils or else the coils were broken. A typical heater is made of six short lengths of tubes connected in series. Steam is admitted through a long header and condensate blown out through a similar discharge pipe. Circulation of fluid over the surface depends upon natural convection. The construction of the heater promotes the formation of strong vertical currents upward along the tube surface which pull in colder material at the bottom.

Here is an example of the effectiveness of one of these car heaters: A car of petrolatum arrived with a broken steam coil. Using an available tank car heater with 25 psi. steam, the car was melted and emptied in 8 hr., even though the outside temperature was at zero deg. F.

A leading petroleum company began buying a number of tank car heaters and adapting them for heating large storage tanks by lopping off the long ends and connecting them to internal manifolds. Company engineers claimed that these heaters gave them much more efficient heating than they could get from flat coils.

From this idea developed the LFT storage tank heater. Two concentric vertical rows of finned tubes are connected to top and bottom headers, with steam introduced at the top and condensate removed from the bottom. One or more units are installed per tank to give whatever heat liberation is necessary. Three different refiners report that the installed cost of these heaters is actually less than the labor cost alone of installing flat coils in the bottom of storage tanks. Although tank heaters were originally designed for oil, they have gone into many other services, including those requiring corrosion-resistant construction.

Typical Coefficients for LFT Sectional Exchangers

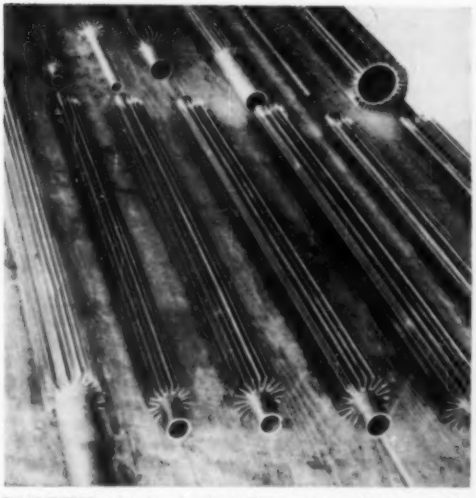
Expressed as Btu./(hr.) (sq. ft. external surface) (deg. F.)

Residuum to crude oil	10 to 12
Bunker C fuel oil to steam	12 to 15
Vegetable oil to water	13
Paraffin wax to water	18
Vegetable oil to steam	17 to 22
Heavy gas oil to heavy gas oil	20
Crude oil to light gas oil	29
90% Ethyl alcohol to water	29
Gas oil to steam	30 to 40
50% Caustic solution to water	35
Naphtha or kerosene to water	38
Light hydrocarbons to steam	40 to 80
Natural gas to kerosene	5
Air to water	10 to 15
Air to steam	15 to 20
Hydrogen to water	15 to 20
Natural gas to water	25 to 30
Bunker C fuel oil to steam (tank heater)	8 to 10
Light lube oil to steam (tank heater)	14

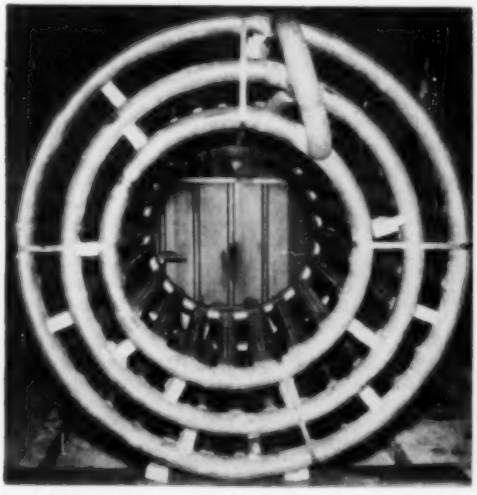
Note: These coefficients are for flow conditions and fin metals ordinarily used. Unusual conditions require individual analysis.

The natural convection set up by one of these heaters in a tank containing 35 ft. of SAE 50 lube oil has been observed to cause an upward flow sufficient to break the surface of the oil and rise to a height of 1½ in. above the level of the surrounding liquid. This circulation action makes the tank heater suitable for many blending jobs.

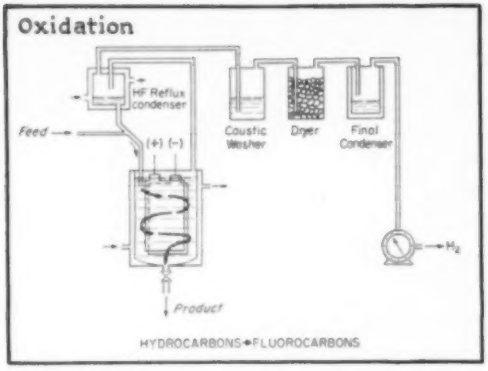
Along with the growing use of tank car and storage tank heaters there has been a trend to special vertical LFT coils in process vessels. These coils are designed to replace either bare internal coils or external jackets. A big advantage obtained where an LFT coil replaces a bare coil is the reduction in volume taken up by the coil. In one case an LFT coil occupying 14 cu. ft. replaced a bare tube coil which took up 56 cu. ft. The additional 42 cu. ft. of volume made available permitted the processing of larger batches in the same reactor.

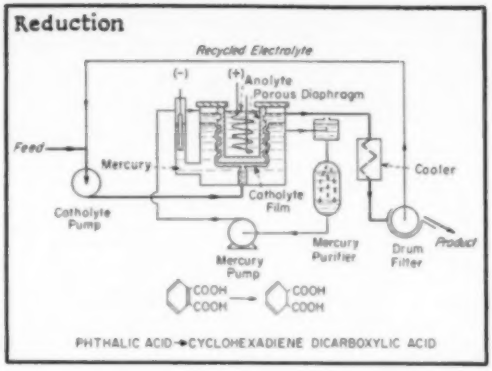


DIAMETER of tube, depth of fins can be varied to suit the particular service conditions involved.



REACTOR COIL consists of three concentric rows of finned tubes, may double as draft tube.





Put Electro Organic Chemistry to Work

Can you? There's a good potential in chemicals that are tough to prepare otherwise; in new and improved processes for electrodeposition from non-aqueous solutions; and in polarographic analysis of mixtures of organic compounds.

MARSHALL SITTIG

Maybe industry will take a cue from the electrochemical fluorination process of the Minnesota Mining and Manufacturing Co. Based on the Simons' electrolytic cell, the process gives 3-M a giant thrust and highlights a neglected but challenging segment of industrial chemistry.

WHAT'S HAPPENING

Here are some recent developments in electro-thermic chemistry:

1. The reaction of methane and air to give formaldehyde.
2. The reaction of benzene and CO_2 to give benzoic acid, diphenyl, and carbon black.
3. The treatment of benzene to give diphenyl, carbon black, and acetylene.
4. The decomposition of pyridine to aliphatic amines.
5. The hydrogenation of pyridine to piperidine.

A unique advantage of electrochemical processes is demonstrated by a procedure based on the supply of electrical energy in short pulses (durations of the order of a microsecond). In this process the desired reaction is completed without giving the undesired reaction a chance to complete itself. The developer claims that it can be used for hydrogenation, dehydrogenation, cracking, and polymerization of organic compounds.

LIQUID-PHASE REACTIONS

The majority of emphasis, however, has been on liquid-phase electro-organic reactions. So let's take a look at the possibilities of the industrial synthesis of organic compounds through liquid-phase electro-organic oxidation and reduction.

HOW IT WORKS

Just like any other electrolytic process. You have two poles—an anode and a cathode. Oxidation takes place at the anode and reduction at the cathode. A porous diaphragm may be used to separate the anode from the cathode and to prevent the oxidation products from mixing with the reduction products. In electro-organic cells, the accumulation of electrolysis products at anode or cathode causes polarization. This gives rise to a requirement for higher voltages (overvoltages) to move the products away from the electrode and keep the process going. In electro-organic chemistry, the material to be oxidized or reduced usually acts as a depolarizer. Thus, the organic material absorbs the oxygen at the anode or the hydrogen at the cathode. The amount of oxidation or reduction which takes place depends on a number of variables.

PROCESS VARIABLES

The usual variables involved in straight chemical or catalytic processes also affect electrolytic processes:

1. Temperature. Increased temperature increases conductance of the bath up to a certain point above which conductance decreases with a further increase in temperature. Increased temperatures decrease the overvoltages of the electrodes. Temperatures from 80 to 200 deg. F. are commonly used.
2. Degree of agitation. Where the organic material is emulsified or suspended in the electrolyte, very efficient agitation may be necessary.
3. The presence of catalysts or other added substances. Salts having variable valence states may be effective promoters for oxidations or reductions.
4. Concentration of reactants. The organic reactant is commonly present to the extent of 10-30 percent by weight of the electrolyte in the bath.
5. Nature of reactant.
6. Nature of solvent used. It should be highly conductive. This involves the use of highly-ionized materials—in water solution or in non-aqueous media. The important factor is ready availability of ions to carry the current, permitting the use of low voltages. A low viscosity solvent is also desirable to make the

---

MARSHALL SITTIG is a familiar name to readers of *Chemical Engineering*. He is a chemical engineer who has made significant contributions to the professional literature.

migration of ions easy. Poor conductance gives rise to high energy losses due to heating the bath. The organic compound may have to be emulsified if it is not soluble in the available conductive media.

In addition, we are now faced with variables peculiar to electrochemistry. These include:

1. Current density. This is usually expressed as amperes per square foot of electrode surface. It may be varied by changing the electrode surface at constant current or by changing the amount of current. An increase in current density increases the overvoltage at the electrodes. Commercial values of 30-50 amp. per sq. ft. are typical.

2. Current concentration. This is expressed in terms of amperes flowing per unit volume of solution. If allowed to rise excessively, the bath will heat up.

3. Nature of the electrode material. The nature of the electrode influences the overvoltage at the electrode. Interestingly enough, not only chemical composition but physical structure (whether cast or cold-rolled) and surface treatment (etching, e.g.) are important. Typical anode material for alkaline solutions are iron and nickel. Carbon and graphite may be used in both acid and alkaline solutions. Platinum (and in some cases, lead) may be used in acid solutions. Copper, zinc, cadmium, mercury, tin, and lead have been used as cathode materials.

4. Applied voltage. Cell voltage is one factor determining the products formed. Most work is carried out at about 10 v. dc. Higher voltages, when used do not exceed 100.

EFFICIENCY

The many process variables may give the impression of complexity but their control is straightforward in most cases. Therefore, precise direction of a desired reaction can be achieved through careful handling of these variables. Yields obtained are comparable in many cases to those obtained by other synthetic methods. Higher yields and purer products may result from electro-organic manufacture due to the possibility of exact control of process variables.

In theory, one Faraday of electricity, which is 96,500 coulombs (26.8 ampere hours in engineering units) should produce one chemical equivalent weight of a product. In practice, this may not work out. Various factors, such as the formation of byproducts, reduce the amount of desired product formed. This gives rise to the expression of current efficiency which is the weight of product formed divided by the weight which should have been formed by the ampere hours used.

Energy requirements are commonly expressed as killowatt hours per pound of product. Assuming electricity at 5 mils per kwh., and an energy consumption of 10 kwh. per lb. of product, electrical energy alone would cost 5 c. per lb. The needs for efficient current utilization and low-cost power are obvious.

Costs of product purification may be lower in electro-organic preparations since the products from electrolytic cells are not contaminated by metal salts from inorganic oxidizing or reducing agents in most cases.

COMMERCIAL APPLICATION

Commercial electro-organic oxidation and reduction have not been widely practiced to date.

In one application, however, anthracene has been oxidized to anthraquinone. The anthracene was dissolved in a sulphuric acid solution and a platinum anode was used. This is an application where added carrier salts have proved effective—cerium, vanadium and chromium salts having been used as oxygen carriers in the electrolyte.

Nitrobenzene was reduced to paraaminophenol on a fairly large scale in World War I. A sulphuric acid solution was employed and platinum cathodes were used. This is the Gattermann reaction.

Until recently, an important example of electrolytic reduction was the manufacture of the hexahydric alcohols, mannitol and sorbitol, by the Atlas Powder Co. at their plant near Wilmington, Del. A batch process was used employing lead anodes and lead-mercury amalgam cathodes. A dilute sulphuric acid solution was used as the electrolyte and the cells are rubber or glass-lined.

An electro-organic oxidation reaction which is attaining increasing prominence is the electrochemical manufacture of the fluorocarbons, based on patents by J. H. Simons and practiced by the Minnesota Mining and Manufacturing Co. Liquid hydrofluoric acid is used as the solvent for the organic compound to be fluorinated. The voltage used (5-8 v.) is insufficient to generate free fluorine under the existing conditions but is sufficient to cause the production of fluorine-containing compounds. The products are relatively insoluble and either evolve with the cell gases or settle to the bottom of the cell, from which point they can be drained. Thus, the process is suited to continuous operation. Nickel anodes are used; the cell and cathodes can be made of iron and steel. No diaphragm is used in this process.

Other reactions which have been recently suggested for application of the electrochemical approach include:

1. The reduction of maleic acid to succinic acid. This involves the reduction of the carbon-carbon double bond in an unsaturated acid without reducing the acid to the alcohol.

2. The reduction of pyridine to piperidine. This involves reduction of the double bonds in a heterocyclic ring to give a saturated compound.

3. The reduction of caffeine to desoxycaffeine. This involves the reduction of a carbonyl group to a CH_2 group without reducing any of the double bonds in the caffeine molecule.

FUTURE

Various objections have been offered to the use of the electro-organic technique. Let's look at some of these and their remedies:

Objection—Relative slowness of reaction and consequent low capacity of unit.

Remedy—Use of a continuous cell. (One is described by Condit in U. S. Pat. 2,537,304.)

Objection—Careful process control is necessary.

Remedy—This is equally true of alternate catalytic processes.

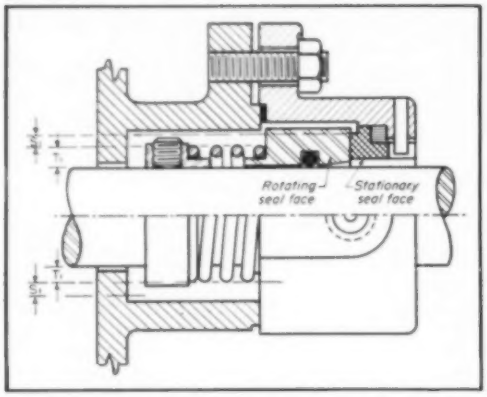
Objection—Cost of power.

Remedy—Location in low-cost power areas—perhaps near new atomic power plants.

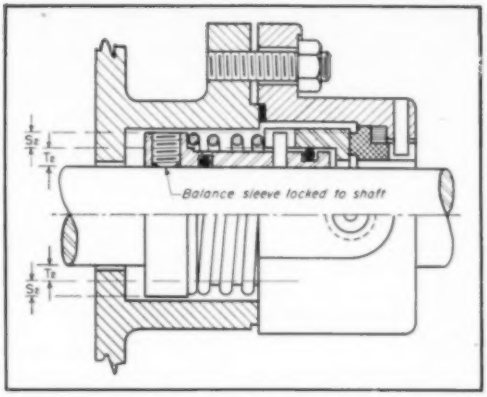
On the credit side, we also have the unique ability of electro-organic methods to direct oxidation or reduction to the specific portion of the molecule where the effect is desired.

To sum up, electro-organic chemistry is a neglected segment of the vast and growing field of industrial organic chemistry. It is surprising, but true, that it has been the subject of only one book published in the United States. That book was written by E. J. Brockman and was published in 1926, a quarter of a century ago. Although it has been given some attention by other investigators, total literature contributions by all workers represent a very small fraction of the voluminous literature of organic technology.

It is true that there are many variables in electro-organic reactions. It is also true that much of the literature is confused because these variables have never been systematized. But, in spite of these problems, there is no better time to bring out the possibilities inherent in electro-organic chemistry.



UNBALANCED SEAL is limited to services below 125 psi. maximum. Pressure over area S_1 keeps the seal faces in contact. Seal faces must also absorb the extra thrust imposed by the fluid pressure over area T_1.



BALANCED SEAL can be used for high pressures. Here the thrust imposed by the fluid pressure over area T_2 is transmitted to the pump thrust bearing. Pressure over area S_2 is just enough to keep the seal faces in contact.

Give Mechanical Seals a Chance

The advantages of mechanical seals for pump shafts warrant every effort to avoid their limitations. This article will help you to attack your sealing problems more intelligently.

DAN R. RANKIN

Restricting leakage around the rotating shafts of centrifugal pumps has been a major problem for design engineers and plant operators ever since the centrifugal pump was first introduced into process service. For many years efforts have been made to develop successful means of replacing packing with mechanical seals.

The success of these efforts is evidenced by the number of seals which are now performing satisfactorily in many operations where packing has never been satisfactory. Pumps handling light fractions in refineries where the stuffing boxes frosted over from evaporative cooling of leaking liquids now operate smoothly with no indications of appreciable leakage. Slurry pumps which wore out packing within a week now run for months with abrasion-resistant seals before requiring replacement of seal faces. Processes where extremely high suction pressures required throttle bushings and bleed-back lines, representing appreciable recycle of the liquid back to the low-pressure side, have been equipped with balanced seals which successfully do the job week in and week out.

Mechanical seals have replaced packing on thousands of domestic water pumps. The large volume of these pumps built with mechanical shaft seals instead of packing has brought their price down so that they cost no more than packed pumps.

Mechanical seals are very much like the little girl who had the curl down the middle of her forehead—when they are good they are very, very good, but when they are bad they are horrid. If a seal ring cracks, the leakage can be much greater than you would get from worn packing, and you have no warning of failure. It is also not uncommon to take a pump off the line, rework the seal and put it back into service, only to find that the seal was improperly assembled and the whole process must be repeated.

If, in trying seals for the first time, you have such an experience, you may want to ban seals from your plant operations. In fact, very few operators who have used seals extensively have not had some trouble getting them going initially. Many of these failures could be avoided if the operators and engineers had a better understanding of the problems and characteristics of mechanical seals.

Since seal face rings must be installed over the end of the impeller shaft it is not possible to work on a seal without removing the impeller. For this reason, the customary working area behind the packing container and the pump bearing is not required when seals are used. Also, the usual length of a mechanical seal is appreciably less than that of packing.

Thus, a pump designed specifically for a seal has the impeller much closer to the pump bearing, greatly reducing the shaft deflection caused by runout or side forces from hydraulic thrust on the impeller. It is also less expensive to manufacture a pump specifically for a seal than to make a pump for packing and later adapt it for a seal. These factors make it more desirable to purchase pumps specifically designed for seals than merely to adapt seals to existing designs.

Some purchasers specify seals on pumps with the units so constructed that packing can be substituted in case the seals do not operate properly. This procedure is unsound. If you are not convinced that seals will work, then forget seals and specify packing.

DAN R. RANKIN is chief engineer of Peerless Pump Div., Food Machinery and Chemical Corp., in Los Angeles.

If a seal is indicated, give it every chance by having the pump correctly designed for the best possible seal.

Often you want to verify that a seal can handle a particularly "tough" service, but you hesitate to experiment with a pump in the process because of its relationship to the operation as a whole. You can build a relatively inexpensive testing device which will circulate the fluid at process temperature through a dummy pot, using a seal of the actual size at the proposed speed to determine whether or not the application is feasible.

In purchasing a pump with a mechanical seal it is just as important to see that the pump construction permits easy replacement of the seal as it is in purchasing a packed pump to see that there is ample room to maintain the packing. With some pumps you can get at the seal by simply removing an end plate and the impeller. With many general service process pumps you don't even have to disturb the discharge piping. However, with some pumps it is necessary to take the unit into the shop and pull bearings, or to completely disconnect the piping. Such construction should be avoided whenever possible.

Realizing the importance of quickly getting a pump back on the line if a seal fails, some manufacturers have built seals in cartridge form which permits them to be checked on test prior to installation. The critical lapped wearing faces and O-ring resilient elements then do not need to be disturbed when installing the seal in the pump. The only joints which have to be made are those between the sleeve and the shaft and also between the flange and the pump housing.

TEMPERATURE LIMITATIONS

Mechanical seals which have O-rings or bellows of neoprene, Hycar or other materials of similar characteristics cannot be operated above 250 deg F. When using Teflon or Kel-F for temperatures up to 450 deg., seals become more expensive. The chevrons or tapered wedges used require a greater diameter to provide correct resilience and operation of the seal.

At present there is no satisfactory mechanical seal for process services above 450 deg F. Devices can be arranged to cool the fluid next to the seals, so liquids appreciably hotter than this actually can be pumped.

There is nothing definitely in sight today indicating that seals will be available for temperatures above 450 deg F. However, projecting the rapid progress which has been made in synthetic materials over the past ten years, it is reasonable to expect that resilient materials for use at higher temperatures may be developed in the near future. It is also possible that seal designs which eliminate the critical resilient elements will be developed, but none is offered commercially today.

PRESSURE LIMITATIONS

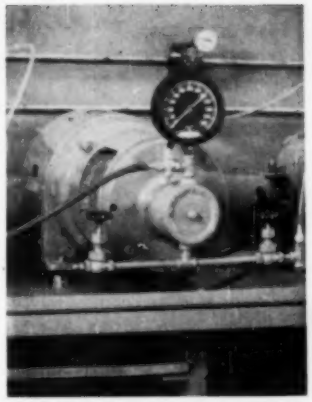
Most all seal manufacturers make both unbalanced and balanced seals. Unbalanced seals are less expensive and usually are not made in cartridge form so that they can be pre-tested. An unbalanced seal should not be used where the pressure on the seal exceeds the manufacturer's rating. When one is used at pressures in excess of 75 psi. differential across the seal, its life is appreciably reduced. Normally, unbalanced seals should not be used at pressures above 125 psi. even for intermittent operation, as the faces may gall, particularly when pumping a fluid with poor lubricating properties.

A balanced seal is so designed that the pressure between the wearing faces remains essentially constant over a wide range of pressures on the seal. With properly balanced seals it is possible to go up to virtually any pressure and still obtain excellent life. Standard balanced seals can be used for pressures of 400 to 600 psi. without any special consideration. For pressures in excess of this make sure that the seal manufacturer is familiar with your requirements so that he will properly balance the seal for the desired operating range.

The accompanying illustration indicates the forces on balanced and unbalanced seals. With an unbalanced seal the force resulting from fluid pressure on the rotating ring is carried by the seal faces acting as a thrust bearing. With a balanced seal most of the force is taken by a sleeve firmly attached to the pump shaft, transmitting the force to the pump thrust bearing. The diameter of the rotating ring in relation to this sleeve is so adjusted that there is as much pressure between the faces of the seal tending to open them as there is behind the ring tending to close them.

HOW TO BALANCE A SEAL

The best way to balance a seal is simply to vary the diameter of the faces, operate the seal under a wide range of pressures, and measure the heating of the seal and power consumption of the driver. With an unbalanced seal the power consumption will go up directly with the pressure, as would be expected with a given friction coefficient and increasing load. With a balanced seal the power consumption to drive the seal goes up very slowly as the pressure is increased over a wide range. Normally it is desirable to have the seal slightly unbalanced so it will tend to close as the pressure increases. This prevents the seal from opening on a pressure surge.



TEST STAND permits you to prove in a seal before actual installation.

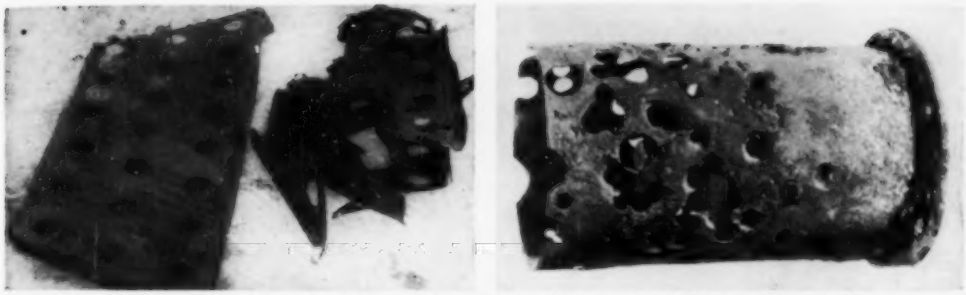
Many users standardize on balanced seals because then they do not need to worry if the pump is transferred to a different operation with a higher suction pressure.

BALANCED VS. DOUBLE SEAL

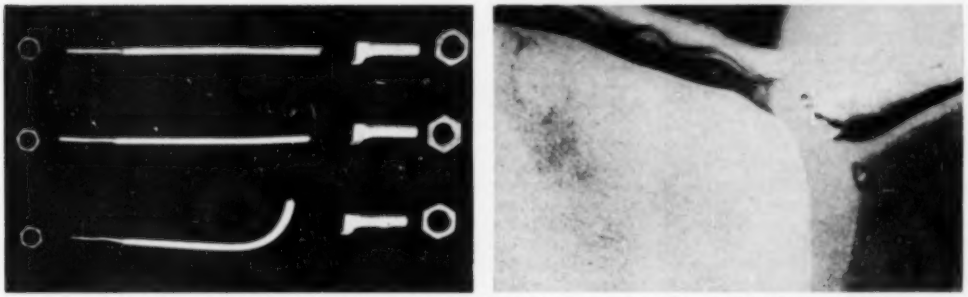
A number of years ago double seals were used wherever pressures exceeded those which could be handled with unbalanced seals. A double seal consists of a seal mounted next to a pump impeller and another one at the bearing end of the stuffing box. Fluid at a pressure normally above that of the pump suction is introduced between the two seals. Usually this requires a separate source of pressure and greatly increases the cost and complexity of the installation. To some extent this type of installation has also been used where abrasives are present, under the theory that with the pressure higher between the double seals than in the suction area of the pump, clean fluid would flow through the seals rather than the fluid containing abrasives.

With further advances in balancing seals and in providing wearing faces which are extremely resistant to abrasion, the double seal is rapidly being replaced. It is still used in some places where extremely hazardous fluids are being pumped. However, there are few jobs which cannot be done today with a single seal.

Results of concentration cell pitting type of corrosion on a carbon steel pipe line used in water service.



General thinning of type 316 stainless steel bubble tray (left) and pitting of a carbon steel bubble tray chimney (right).



Crevice corrosion of Type 316 stainless bolts (left) and intergranular attack along welds of Type 316 bubble cap (right).

Corrosion . . .
. . . And Its Control in a Chemical Plant

If your plant does not have a definite program for combating corrosion chances are it should, to save both money and materials. Here's what Celanese is doing at its Bishop, Tex., plant—for guidance in setting up a program of your own.

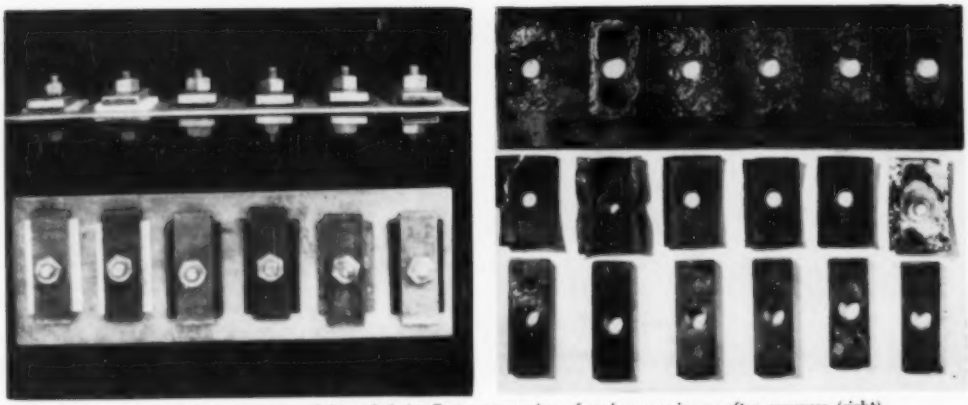
CLYDE W. DAY

Any corrosion program involves coordination of all the various departments concerned with the design, operation, and maintenance of equipment. It may seem trite to say, but the easiest way to solve a corrosion problem is to remove the corrosive media, or that portion of the media which causes accelerated attack. This is quite frequently possible by changing process operations slightly, and can often be much more economical than trying to maintain the method of operation and replace materials. For this reason, corrosion engineers should have a working knowledge of processes involved, and, when any difficulty is encountered, the first consideration should be given to improvement of process. Process and production personnel sometimes find this approach undesirable, but if they can be taught to think in terms of effect on corrosion, the lot of the corrosion engineers, as well as the production engineers, will be much easier.

The program of corrosion prevention should be patterned to the industry and even to the individual plant, since great variation in problems between plants often exist. Therefore, corrosion engineers should be careful not to presume a corrosion organization or program used in another plant will be entirely suited for local problems. The scope of any corrosion program can only be determined by experimentation, with some help perhaps from the experiences of other plants. The program should be examined and evaluated periodically to see if the accomplishments are in proper proportion to the cost. Thus emphasis must shift as problems change, and only when this flexibility is attained is the corrosion program working efficiently.

The corrosion engineer has a number of tools at his disposal which, when properly used, are very effective. Primarily, he should be alert, tactful and cooperative in his work. He should have an understanding of proc-

CLYDE W. DAY *is a corrosion engineer in the engineering department at Bishop.* *This article is based on his paper presented to the South Central Region, National Association of Corrosion Engineers, Oct. 18, 1951.*



GASKETS on a test rack before exposure (left) and their effect on corrosion of various specimens after exposure (right).

ess and be able to observe failures when they occur, interpreting them in the light of process operations. Inspection is very closely related to corrosion work, and reports of inspection are usually also reports of corrosion, and such records are invaluable. Celanese has found that one of the most valuable tools is photography. This is the most effective way to present information, since an executive can tell at a glance what the trouble is without having to read a lengthy word description; and he does not have to get out of the office to see with his own eyes what is taking place in the field. By proper preparation and distribution of reports, management and other interested people can be kept informed of the condition of equipment; and the effectiveness and importance of the work of the corrosion engineers can be impressed on the minds of those responsible for the continuation of the program.

ORGANIZATION

The losses from corrosion difficulties normally dictate the scope of the initial corrosion program. From the time such a program is established, the initiative and enthusiasm of the corrosion engineer establishes the limits of the program, since there are usually sufficient problems to provide outlet for all his energies.

The corrosion section at the Bishop plant was expanded when corrosion was noted in some of our operating units which had not been anticipated from pilot plant work. This was found to be primarily a result of the use of substitute wartime materials. In addition, a water shortage at about the same time forced the plant to operate with limited blowdown from cooling water systems and this caused a considerable amount of stress cracking in the stainless steel condenser tubes.

Two metallurgical engineers were hired and a metallurgical laboratory established to combat these problems. Since inspection and corrosion work go hand in hand, these duties were combined. Later, certain engineering jobs of a maintenance nature were seen to fall within the same field of endeavor, so the three fields are now combined in one section of the engineering department. Currently, there are eight men working in this section and all dealing in some degree with corrosion. This organization is suitable for the present needs, but will change as the problems change. This organization is presented as an example and not necessarily as a model, since your needs and resultant organization will differ to some extent from those of Celanese.

METHOD OF OPERATION

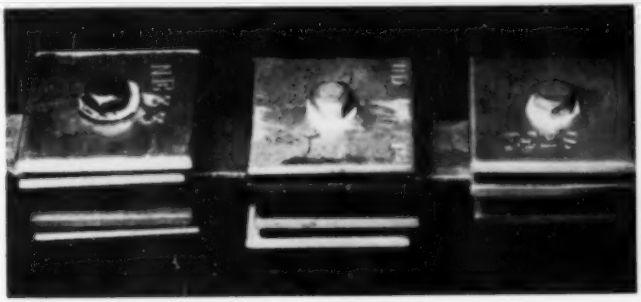
Since corrosion can be a very costly problem, corrosion engineers are interested in methods of preventing and solving these problems if they occur. Before plants are built, tests are usually conducted to determine the efficiency of the process and consideration is given to equipment design and materials of construction. One of the corrosion engineer's chief problems is to obtain sufficient test results in pilot plant stage or at least prior to building a full scale plant. Any information that can be obtained in the preliminary stages will certainly minimize the amount of difficulties which can be expected later in operation.

No material will normally be used if it is known that it will not stand up in service. In spite of the best information available, however, with respect to corrosion, the unexpected sometimes happens, and failures may occur after the plant is placed in operation. The occurrence of these failures makes some type of corrosion control program mandatory and some evaluation is necessary to correct the conditions. Usually some test program is necessary which can be either of a laboratory or field testing nature. If time permits, field exposure is much more reliable than laboratory testing, since plant conditions cannot be reproduced in the usual laboratory.

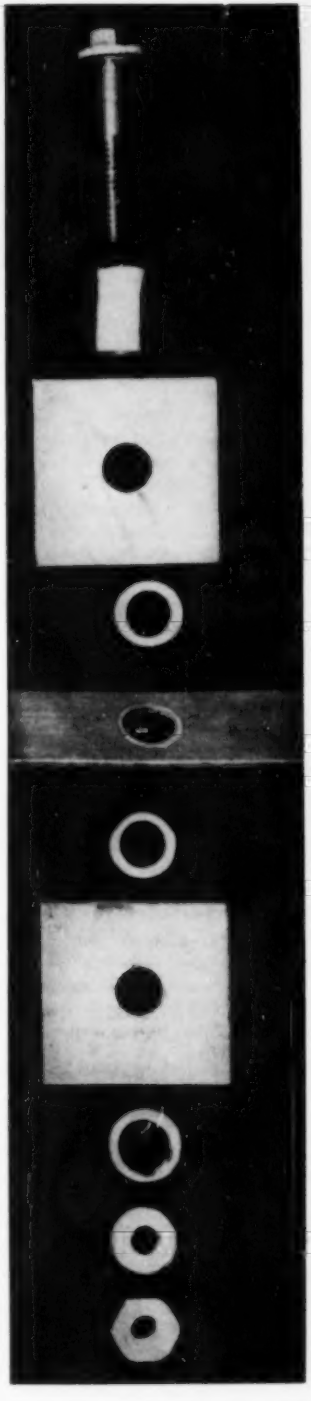
TEST RACKS

For corrosion work at Bishop, two types of corrosion test racks are used for general work. One is the type furnished by the International Nickel Co. which they make and evaluate free of charge. Racks of special design have been developed which are used more extensively, which cost approximately $50 to prepare, expose and evaluate. Each rack holds a number of specimens in duplicate which are insulated from each other and from the rack, Teflon being used as an insulator. The special rack is preferred because it is adaptable not only for testing in large pieces of equipment but for testing in pipelines as small as 2 in. in diameter. All of these test racks are evaluated in the metallurgical laboratory by weight loss method and observation of pitting and other surface attack. Results are reported as penetration in inches per year (ipy.).

All process changes are checked by field tests in addition to previous laboratory testing, and tests are always in progress at various critical points to establish the trend of corrosion in each unit. This program has been found to be very beneficial since points of trouble can be determined without major unit shutdown. Also, repairs can often be predicted by using some of the more conventional inspection



TEST RACK which holds specimens in duplicate—insulated with Teflon.



tools such as thickness gages of the non-destructive types.

GASKETS

Trouble has been experienced with gasketed joints in stainless piping. As a result, an evaluation program has been conducted for various gasket materials. A special test rack was designed for use which proved quite successful. Some may feel that such a thing as a gasket is very insignificant, but Celanese has found that it can be a very expensive problem. Also it is such minor things which, when overlooked in design, ruin the operation of an otherwise good unit. From this testing experience, it was found that certain gasket materials will accelerate corrosion in some corrosive media. For example, a shipment of new 316 stainless valves from a leading manufacturer showed pitting under the bonnet gaskets. Upon investigation, it was found that the combination of the manufacturer's test water and certain compounds in the gasket formed concentration cells which resulted in pitting. The gasket used was an unauthorized substitution for one specified which, from experience, would have been satisfactory.

WATER TREATING

The water treating and inhibitor test program at the Bishop Plant is carried on by another department within the plant, the evaluation work being done by the metallurgical laboratory. This test program is quite extensive and has been successful. Pipe specimens of ¾ in. ips. × 8 in. are used in this program. Tests are conducted not only in the operating water systems but a pilot plant is available to check new water treatments. This is to avoid the expense and danger involved in a full scale trial.

UNDERGROUND PIPING

The Gulf Coast area is noted for its low resistance soil and resultant electrolytic action on buried piping systems. We have experienced some underground leaks in carbon steel piping as a result of this local soil condition but since the installation of a cathodic protection system, our leak record has shown a sharp decline.

WELDING TECHNIQUES

The use of proper welding techniques for alloys is of extreme importance since use of improper welding procedures can contribute to intergranular corrosion. A qualification program is carried on for all welding operators to insure the use of proper welding techniques. Qualification of welders is done in accordance with the ASME Section 9 test for piping materials with the addition of a test on stainless steel. Welders are retested approximately once a year. All evaluation of tests is done in our metallurgical laboratory, since all facilities needed for tensile and bend tests are available.

OTHER PROBLEMS

There are other types of corrosion problems many of which are peculiar to a process. Fretting corrosion is an unusual case which can occur.

Warehousing also becomes a big problem where alloys are concerned. Such items as identifying metals, checking analyses, and color coding different materials become very important. The improper handling and storage of expensive materials can cost a company large sums yearly. Storage of stainless, for example, in wet areas such as near cooling towers can cost many dollars by pitting and/or stress cracking.

Painting is a problem in any plant, but is always more severe in areas of water spray or where spillage of products is encountered. The Bishop plant conducts tests only when specific problems are encountered, and does not have a routine test program.

Editorial Viewpoints

So Goes Business

Pending next month's more comprehensive diagnosis and report on the economic health of the chemical process industries, here are some of the things to watch for:

► Tighter squeeze on taxes. The recent Mills Act will raise the March 15 ante from 25 to 35 percent of the year's total. During the first six months, industry will now be liable for a full 70 percent of its annual tax bill.

► More inventory selling. One way to raise cash is to reduce production temporarily and sell off inventories. In some non-defense lines these are already uncomfortably high.

► Weakness in commodity prices. If manufacturers are under pressure to sell from inventory, they will not be buying as much raw material. Commodity prices, especially those traded on the organized exchanges, are particularly vulnerable.

These three factors suggest, according to McGraw-Hill economists, "a somewhat shaky first quarter with not much rise in industrial production and spotty—if not general—weakness in wholesale prices." However, our advisors are quick to point out that these rough spots in the course of general business are likely to be only temporary deterrents. Employment and income will remain high because defense production will continue to expand and the capital goods output will be at a very high level.

Our own observations of the chemical economy are most encouraging. The larger units that account for most of the capital investments in plants and equipment still have ample cash reserves. Or, as Carbide and others have demonstrated, they have no difficulty in getting new money if they need it. All indications to date are toward continued growth and expansion.

Selling Is Everybody's Business

Warren Kinsman, from the fullness of his experience, has started a one-man campaign for chemical salesmanship. Last month at Atlantic City he told the chemical engineers that processes are developed and plants are operated only when goods are sold—and stay sold. Speaking later in Wilmington to the Chemical Market Research Association, the Du Pont executive urged his listeners to get ready "for the next step by which you can be of greater service to your employers, to the nation, and perhaps to the world at large."

"We are on the verge," he said, "of the need for the greatest salesmanship effort that this country has ever been confronted with. And market analysts are in the vanguard of that campaign. . . . So you . . . had better focus your sights on what will confront us two or more years ahead and tell us how we can sell and distribute profitably the prodigious quantity of goods and services that will be seeking a home to keep factories busy and avoid the unwanted social consequences of unemployment."

This is not gratuitous advice, nor just the idle talk of a professional speechmaker. It comes from a man in a particularly favorable position to know about "determining the facts by which judgment is guided on expenditures for product and process research, new investments in manufacturing facilities and the creation of demand for use, conversion or consumption of chemicals."

Surely selling is everybody's business.

Our Roll of Honor

This is not for youngsters—or for the "Johnnies-come-lately." It is for us old-timers—the "I-remember-when" generation. It's a memory test for subscribers to this magazine from way back in the days when it was called "Chem. & Met.," or "Met. & Chem.," or even "Electrochem Industry."

This is our fiftieth year, and before long we intend to celebrate appropriately our golden anniversary. At that time we intend to publish an honor roll of our oldest continuous subscribers in each of the 48 states and principal foreign countries.

Canada has already sounded her challenge in a stirring letter from 82-year-old Ernest A. LeSueur of Ottawa (see *Chem. Eng.*, Dec. 1950, p. 195). For those who may have forgotten this gentleman's notable achievements, let us remind you that in December 1889 while still a student at MIT, LeSueur invented the first practical process and diaphragm cell for electrolytic alkali manufacture. Due to his youth and inexperience, he never got an effective patent on his invention. But the values that have come from the heavy chemical industry he thus helped to establish have since run into the billions of dollars.

Not all of us can boast of comparable accomplishments. Nor do we intend to limit our honor roll to those whose names are widely known throughout our industry and profession. What we want most to know is how long you have been a subscriber and what you have found of lasting value in our association. Please address a letter or post card to Editors Parmelee and/or Kirkpatrick, c/o *Chemical Engineer-*

ing, 330 West 42nd Street, New York 36, N. Y., and we will tell you of some plans—and prizes we have in store for you. Do not put it off. Write right now.

What Price Stigma?

Last month Du Pont and Glidden Co. succeeded in removing a stigma from their names. But they paid—and paid dearly—for it.

It all started back in July 1948 when the Justice Department obtained indictments against Du Pont, Glidden and 12 other paint companies and 21 of their officials charging conspiracy to fix paint prices, discounts and allowances.

Twenty of the individuals pleaded "nolo contendere," paid fines ranging from $1,000 to $3,500 each. One official fought the indictment; charges against him were dismissed.

Twelve of the companies pleaded "nolo contendere." paid fines of $5,000 each. Two companies—Du Pont and Glidden—fought the indictment; last month it took the federal jury only six hours to acquit them.

We admire the courage of the two companies who took the hard—and expensive—way out; they spent close to $100,000 each to keep the stigmas off their names. But as Dwight P. Joyce, Glidden's president, put it:

". . . our belief in justice prompted us to make the fight . . . it was well worth the $95,000 to take the stigma off the company's name."

Water: A National Problem

Most chemical engineers already know that the scarcity of water is a serious matter in some parts of the county. In one Southwest area, for instance, there have been grave questions as to whether any additional industrial enterprise needing fresh water can be accommodated.

Recognition was given recently to the broad problem by Secretary of Agriculture Brannan. He said:

"Water is becoming . . . a limiting factor to national progress. There is serious need for improved measures that will permit us to make more effective use of the rain that falls on the land and the water that flows from it—not only for agriculture but for our entire economy."

Chemical engineers and works executives must give attention to this problem. Quite obvious is the need to review the water needs of our industry and to develop ways to conserve it.

Less obvious, but equally important, is the effort we can take to keep our neighbors from being wasteful. Plant management can—and should—help their non-technical neighbors avoid both waste and contamination. And not to be neglected is the influence we must exert on municipal governments—too often among the worst offenders in water waste and stream pollution.

Provides More Than It Uses!

"The petroleum industry is now producing 5,500 tons more sulphur than it is using in its own operations."

This is the encouraging statement of Deputy Petroleum Administrator Bruce K. Brown in emphasizing the substantial gain made in sulphur recovery by petroleum producers during 1951. The acid-recovery and sulphur-extraction activities certainly have been developed very effectively to permit such a fortunate situation in the last few months of the year.

But the sulphur problem remains with us as a major difficulty for most of the chemical process industries. Very recent estimates of the Defense Materials Procurement Agency show that the demands for sulphur (mainly as sulphuric acid) continue to grow faster than the supply. Unless some phenomenal new source is developed soon there will be a significant shortage at least until 1955.

As we congratulate certain petroleum operators on their contributions, it is still not time to relax our efforts. No permanent relief is in sight. The most certain solution for the sulphur scarcity still remains the idea that the price of sulphur ought to be $35 per ton. For, as one expert put it, "sulphur would then be worth saving." Nobody expects so drastic a remedy to be adopted. But the idea is one to ponder.

Volume 59—Chemical Engineering—Number 1

Chemical Engineering, with which is incorporated *Chemical & Metallurgical Engineering*, is the successor to *Metallurgical & Chemical Engineering*, which in turn was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine*, effected in July 1906.

The magazine was originally founded as *Electrochemical Industry*, in September 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January 1905 when it was changed to *Electrochemical & Metallurgical Industry*. In July 1906 the consolidation was made with *Iron & Steel Magazine* which had been founded eight years previously by Dr. Albert Sauveur. In January 1910 the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the title was changed to *Chemical & Metallurgical Engineering* and weekly publication was begun Oct. 1, 1919. Monthly publication was resumed in March 1925.

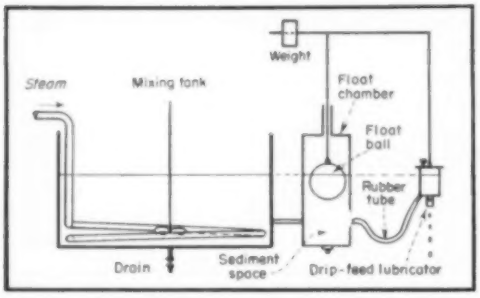
In August 1946 the words "*& Metallurgical*" were dropped from the main title to bring its name more in keeping with the editorial content.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee. Ten years later, Nov. 1, 1928, Dr. Parmelee assumed other responsibilities in the McGraw-Hill Publishing Company and Sidney D. Kirkpatrick was appointed editor. Dr. Kirkpatrick was named editorial director July 1, 1949, and at that time he was succeeded as editor by John R. Callaham.

The present editorial staff of the magazine comprises, in addition to Dr. Kirkpatrick and Mr. Callaham: L. B. Pope, managing editor; T. R. Olive, senior associate editor; C. H. Chilton, associate editor; Joseph A. O'Connor, news editor; Morgan M. Hoover, Margaret Redfield and R. V. Reeves, assistant editors; Francis Arne and A. J. O'Brien, Jr., editorial assistants.

Editorial regional representatives are: James A. Lee, Houston; Elliot Schrier, San Francisco; P. C. Byrnes, Chicago; R. S. McBride, Washington.

[All rights to above magazine titles are reserved by McGraw-Hill Publishing Company, 330 West 42nd St., New York 36, N. Y.]



Constant Rate Feeder for "Drop-Rate" Flow

T. Shaw, *Chemical Engineer, Nkana, Kitwe, Northern Rhodesia, Central Africa.*

★ **November Contest Prize Winner**

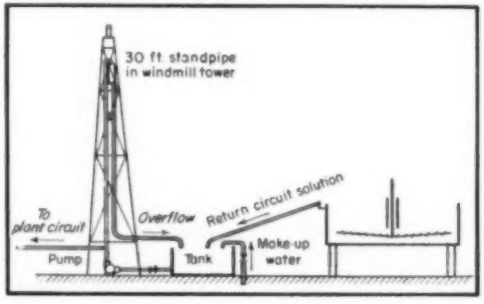
For use in an electrolytic solution circuit we needed a feeding device that would add an extremely small flow of addition agents at a constant rate. It was necessary that the rate of addition be controllable and that the equipment be robust and not subject to fouling by the addition agents. The design developed appears in the sketch above.

Any available tank of suitable size (a 55-gal. drum for example) can be used for mixing the addition agents and had best be equipped with a small electrically driven agitator. In our particular case a steam coil was also needed for dissolving the addition agents. We connected a pipe above the sediment level to a float chamber made of pipe, and provided a drain on the mixing tank to run off sediment at times. A plug in the bottom of the float chamber also permits the drainage of sediment from that point.

The upper part of the float chamber is fitted with a vertical piece of pipe about a foot long to serve as a guide bushing for the float rod. At the top of the rod is a horizontal rod carrying at one end an ordinary drip feed lubricator, and at the other a weight to balance the lubricator and prevent binding in the guide bushing. The lubricator is connected by a piece of rubber tubing to a point above the sediment level in the float chamber. To assure the maintenance of a constant head within the lubricator the connections between the float and the lubricator are rigid. In this way the lubricator rides up or down as the level in the mixing vessel changes, but always with an invariable head above the lubricator orifice.

The rate of feed is easily adjusted by turning the regulating screw at the top of the lubricator. The rate of dropping can be observed in the small sight glass which such lubricators have below the main glass reservoir. The drops then fall freely into the tank which is to be treated. In our case the receiving tank is the receiver for the various electrolyte return lines. It discharges to the electrolyte recirculating pump.

This feeder has been found to operate very satisfactorily. Its settling volume assures that no sediment can be carried over to block the drip feed orifice and so alter the feed rate. With its simple constant-level mechanism it easily and accurately maintains any chosen rate of flow.



How to Use a Standpipe for Steady Head Applications

Norton Jackson, *Metallurgist, South Australia Department of Mines, Adelaide, South Australia.*

Although the idea sketched above is not particularly novel, I have not often seen it used as a method of head regulation. It does the job, it is inexpensive, and it can be erected with a minimum of materials.

Recently we were faced with the problem of erecting a pilot plant in a very short time. Therefore we examined every section of the proposed plant critically, with the idea of cutting down on the construction work needed in our

---

★ **December Contest Prize Winner**

"Vibrating Reed Makes a Good Level Detector for Dry Powders and Liquids."

A prize of $50 in cash will be awarded to R. D. Spangler and E. D. Cooper, Polychemicals Dept., Research Div., Experimental Sta., E. I. du Pont de Nemours & Co., Wilmington 98, Del. The prize winning entry will appear in the February issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

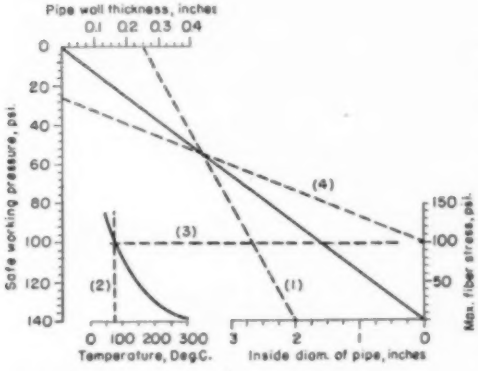
The winner each month will be announced in the issue of the next month, e.g., the January winner will be announced in February and his article published in March. Judges will be editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published at space rates if acceptable.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

severely overtaxed shops. In considering the surge tank which was to receive the circuit solutions, it was decided that this tank would need to be 30 ft. in the air to supply the head needed in several plant units. But this would involve a substantial tower for the support of the tank. Instead, the tank was placed on the ground, with a 30-ft. open standpipe connected to the pump discharge. As the sketch shows, there is an overflow return from the top of the standpipe.

Further to simplify the problem, there was a light windmill tower already in use to support a barometric condenser. It was a simple problem to use this tower also to support the standpipe and its return.



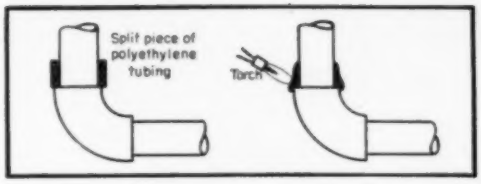
Safe Pressures for Lead Pipe

JOSEPH T. HOGAN, *Chemical Engineer, New Orleans, La.*

Widely used in chemical processing, lead has the unfortunate disadvantage of having its safe working stress fall off rapidly with increase in temperature, so that it is often necessary to check the safe pressure for lead pipe at various operating temperatures. This nomograph facilitates such a check. It is based on the formula $P = 2ST/D$, where P is the safe working stress, psi., S is the maximum allowable fiber stress, psi., T is the pipe wall thickness, inches, and D is the pipe inside diameter, inches. In lead pipe, the nominal size is the actual inside diameter, wall thickness varying according to classifications set up by the Lead Industries Assn. (see their tables and those of the National Bureau of Standards[2]). Because the maximum allowable fiber stress decreases with increasing temperature, to use the formula one must know the allowable fiber stress at the working temperature.

The nomograph incorporates the variable fiber stress and permits calculation of safe working stress for lead pipe from ¼ to 3 in. inside diam., at temperatures to 300 deg. C. For example, what is the safe working pressure for 2-in. lead pipe of 0.251 in. wall thickness at 75 deg. C.? Connect the inside diam. of 2 in. by Line (1) with the wall thickness of 0.251, marking the intersection on the solid diagonal line. Erect a vertical from 75 deg. C. (Line 2) to the curve and proceed horizontally by Line (3) to the fiber stress scale at 100 psi. Connect this point through the intersection on the diagonal by Line (4) with the safe working pressure of 26 psi., the desired result.

REFERENCES
1. Perry, J. H., "Chemical Engineers' Handbook," 3rd. Ed., p. 429 (1950).
2. Nat. Bur. of Stds., Comm'l Std. CS95-41, Lead Pipe.



Sealing Pipes Against Vacuum or Low Pressure Without Shutdown

H. F. REICHARD, *Chemical Engineer, The Kellex Corp., Jersey City, N. J.*

Small leaks in vacuum or low pressure system parts, such as pipe joints, can be sealed without taking the system down by the method sketched above. To seal a pipe joint slip a split piece of polyethylene tubing, or wrap a strip of polyethylene sheeting around the joint as in the view at the left. With a blow torch or gas burner melt the resin so that it flows around the joint as at the right.

This produces a corrosion-resistant seal which will be tight against vacuum or low pressure. Slight burning or charring will not be harmful. If the joint must later be broken the resin seal can easily be cut or burned off.

Pump Trouble? Here Are Some Good Priming Tricks

FRANK GIBADLO, *President and Treasurer, Process Chemical Specialties, Beverly, Mass.*

In dealing with positive pumps such as the piston, gear and vane types, it is well known that the efficiency of the pump depends to a large extent on the amount of clearance between the moving and stationary parts. But such clearance tends to increase with wear and misalignment, as a result of normal operation. Sometimes we find such a pump, old and worn, which will not pick up its prime by ordinary methods.

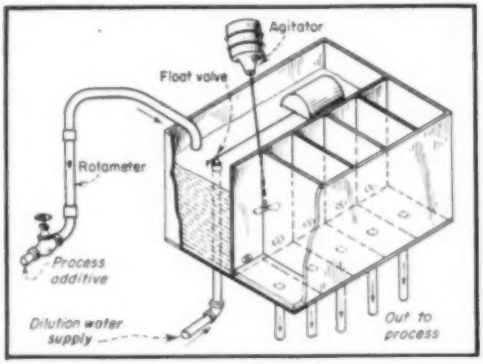
In one case a worn gear pump was used to draw water through 1¼-in. pipe from a driven well, with the water level 16 ft. below the surface. Normally water would be used as the priming agent but in this case the pump repeatedly failed to prime with water. However, use of about a quarter of a can of ordinary cane molasses as the priming agent readily started a continuous flow of water from the well. Subsequently, on several occasions the pump was shut down and then started up again, each time picking up the flow of water without additional priming. When the pump was dismantled several days later there was still molasses in the crevices of the pump, acting as a temporary seal.

Although water is generally used as the priming agent, it is evident that with old and stubborn pumps, more viscous liquids of suitable character may be selected to do the job. They should be chosen so as not to contaminate the liquid pumped seriously, nor to harm the equipment. In the case of pumps that have valves, viscous priming liquids must be used with care owing to the possibility of causing valve sticking if the springs are old and weak.

In several cases where reciprocating pumps were used temporarily to pump from a driven well it was found that operation was impossible. In this case a solution was to insert a regular ¾-in. diam. stiff-wall garden hose into the 1¼-in. well pipe, down to the water level. When the hose instead of the larger pipe was connected to the pump,

water was readily pumped from the well into a pressure tank, and subsequently started up again without priming. For a permanent installation in such a case a better arrangement is to insert a ¾-in. pipe with a foot valve at the bottom into the 1¼-in. well pipe. This size has been found to give the best performance in such cases.

On the face of it, the deliberate use of smaller suction pipe looks like bad practice since, in theory, the pump should be more efficient with the larger pipe. However, with some types of reciprocating valve pumps, it appears that the less air space there is in the suction pipe, the better the pump performance. When the suction line is too big and contains too large a volume of air, it is necessary to make special provisions to bleed off the excess air. Otherwise, too high a pressure on the discharge side will cause the air to "back-fire" into the suction side if the valves are worn and leaky. In such a case the pump simply recirculates the air.



Orifice Box Distributes a Single Flow to Several Points

FRED W. BISHOP, *Chief Chemist, Southland Paper Mills, Inc., Lufkin, Tex.*

One is often confronted with the problem of dividing a single measured flow of a liquid additive to two or more points of application. A steel box, roughly 18 × 18 × 12 in. deep, is divided into two compartments by welding a 12 × 18 in. plate across the center. One side can then be subdivided into the number of compartments representing the number of process application points.

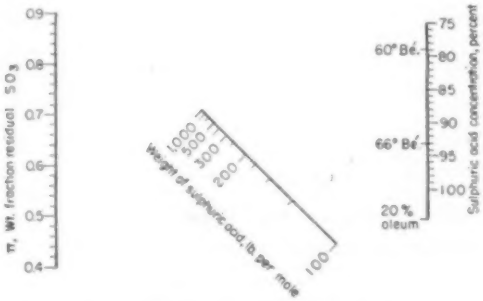
Near the bottom of the 12 × 18 in. compartment plate, a hole is drilled to give entrance into each of the small compartments. These holes should be of sufficient size to accommodate a tight fit with a size No. 6½ or 7 rubber stopper. The rubber stoppers are drilled to hold a piece of ⅛ in. stainless steel shaft 1¼ in. long which is, in turn, drilled to the desired orifice diameter. Regardless of diameter, all of the orifices will have the same discharge coefficient. Pipe couplings are welded under the bottom of each small compartment to pipe the flow from each by gravity to the point of application.

The large compartment is the constant level diluting and mixing headbox. A small motor-driven propeller type agitator does the mixing. The water addition and constant head control are accomplished by using a float ball and valve from the water closet of a typical bathroom toilet. This device is mounted in the large compartment as in a water closet, and a diluting water supply can be connected to the bottom of the valve and float ball assembly. The water level will remain constant in the headbox in any case, whether 1 or 5 gpm. of additive is entering the compartment. The single flow which is to be distributed can be controlled through a rotameter and hand-operated valve.

For best results the total discharge volume of all the orifices at maximum head should be slightly less than the total water adding capacity of the toilet float valve.

For all of the small orifices passing diluted material from the mixing headbox into the individual receiving compartments, the conventional discharge quantity formula applies, namely $Q = CA\sqrt{2gh}$. Since the discharge coefficient C is constant and the head h is always the same in the supply headbox, therefore the discharge from each orifice will be a direct function of the cross sectional area of the orifice opening.

In a five-compartment system, it is a simple matter with calculated orifice diameters to add 40, 30, 10, 10, and 10 percent of the total to the five points of application. The various percentages can be added at any point by merely changing the orifices about. This device has been used in continuous mill operation for over three years with hardly any maintenance requirements.



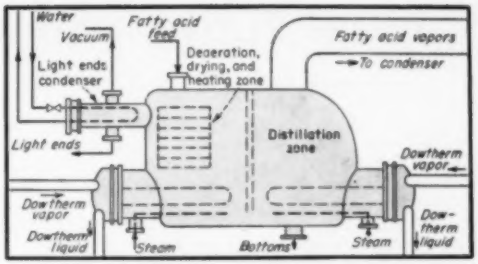
Nomograph Shows Sulphuric Acid Needs for Sulphonations

ROBERT F. BENENATI, *Department of Chemical Engineering, Polytechnic Inst. of Brooklyn, Brooklyn, N. Y.*

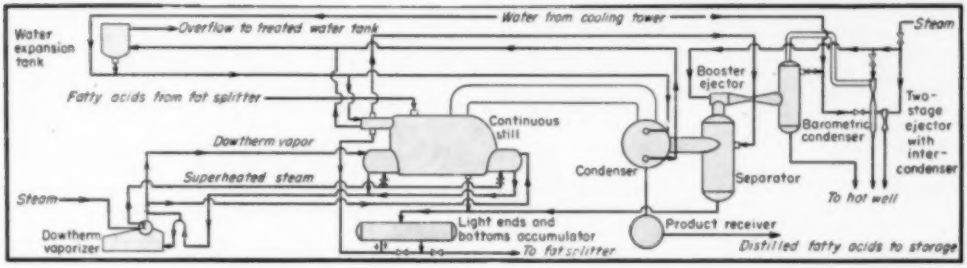
When sulphuric acid is being used as a sulphonating agent, it is necessary to charge sufficient acid to insure a definite SO_3 concentration at the end of the reaction. This residual SO_3 concentration has been labeled π (Groggins, "Unit Processes in Organic Synthesis," McGraw-Hill, 1947) and is a function of the material being sulphonated and the reaction temperature. The value of π is given by $\pi = (WX - 80)/(W - 80)$ where W = pounds of sulphuric acid required per mole of organic to be sulphonated, and X = weight fraction SO_3 in the sulphuric acid. This equation may be rearranged in the form $W = 80(\pi - 1)/(\pi - X)$ and can then be used to compute the pounds of acid required for a monosulphonation if the value of π and the acid strength are known. For disulphonations the value of W calculated from the equation is doubled.

The nomograph presented here permits a rapid estimation of the acid requirements per mole of material being sulphonated. The scale representing sulphuric acid concentration is calibrated in percent H_2SO_4 and also in degrees Bé. for the various commercially available strengths. When acid is available in several different concentrations, the nomograph may be used for a rapid determination of the relative quantities required, thus permitting an estimation of which acid strength is most economical.

New unit is especially suited for unstable stocks. It prevents discoloration of fatty acids by removing light ends. Light end removal and distillation are combined in . . .



Low-Cost Still . . .



. . . Makes Color-Stable Fatty Acids

F. B. WHITE

Fatty acids for use in the manufacture of such items as plastics, candles, and toilet-soaps have to be light in color. Yet most distillation units which purify fatty acids overlook the need for removing the low-boiling fractions of "light ends" that tend to darken. This oversight may be due to the small amount of light ends compared with the residue, which contains all of the unsplit oils or fats remaining from the previous splitting operation along with most of the darker impurities.

HOW STILL REMOVES UNSTABLE LIGHT ENDS

Crux of the process is the two-stage continuous distillation system. The stages are separated by a vertical wall, open at the bottom to allow passage of liquid.

Crude fatty acids are fed to the left-hand section upon a series of plates to preheat and dehydrate the feed. Dehydration is important to prevent fouling of the heat transfer surfaces by dissolved salts introduced with residual water of hydrolysis.

Through distillation in this left-hand zone—operated under high vacuum but lower temperatures than the other section—the light ends are removed overhead along with the outgoing stripping steam. This separates them from the bulk of the fatty acids.

Dehydrated stabilized fatty acids are distilled in the second compartment. Most entrainment is removed in an internal centrifugal separator—and the remainder is caught in a mechanical mist eliminator which operates most efficiently when handling a vapor containing only a small percent of liquid. High over-all collection efficiency, impractical in a single stage, is a result of two-stage design.

High-titer distillates are conveniently handled by the use of tempered water in the fatty acid condenser. Water temperature control is automatic.

WHY STILL IS SUITED FOR UNSTABLE STOCKS

Pressure drop is kept to a minimum by oversized vapor passages. This together with stripping steam and high vacuum insures a very low distillation temperature—and there are no hydrostatic heads to overcome. Continuous operation and small hold-ups also tend to make this still more satisfactory than others for handling heat-sensitive unstable feed stocks. Additionally, heat is applied in a manner least likely to injure the product quality, namely by condensing Dowtherm.

ITS LOWER COST

Delivered and erected, this still is approximately 25 percent cheaper than previous Foster Wheeler fatty acid stills.

This is due to its compact nature, which reduces equipment and erection charges. All piping is eliminated between the two stages, and no piping is needed between the first section and its condenser.

Fatty acids, particularly the more unsaturated ones, break down when kept at high temperatures. This fact was the crux of the following factors of good design which the still embodies: (1) Operation at minimum temperature. Use of high vacuum and a premium on low pressure drop and use of stripping steam. (2) Suitable economic balance between time and temperature in the breakdown of fatty acids. (3) Uniform temperature throughout the heating zone. (4) No substantial mechanical carryover of residue into the vapor stream.

F. B. WHITE is a process engineer with the Industrial Department of Foster Wheeler Corp. He specializes in the design of plants for the process industries.

Capital Ratios Analyzed

H. E. SCHWEYER

NOTE: Three months ago we published an article by another author dealing with the ratio of product value to plant investment (turnover ratio) as a criterion for judging the economic attractiveness of a chemical venture. The following article, submitted prior to publication of the first one, applies much of the same data to the problem of making short-cut estimates of plant costs.—EDITOR.

SEVERAL writers have suggested that capital costs for process plants can be related to the annual value of the products. Tyler[4] states that a plant investment of about one dollar is required for each annual dollar of factory value. Nichols[3] has suggested that capital requirement can be estimated from annual capacity and unit price, although he emphasized that such an estimate must be considered as only an approximation.

The accompanying graph has been drawn in order to study the validity of these suggestions. Capital cost data, corrected to 1950 costs, were taken from *Chemical Engineering*,[1] and prices of products were taken from *Chem. & Eng. News*, May 1 through May 22, 1950, for the maximum package of commercial grade. Some products are represented by more than one point, indicating differences in investments for competing processes.

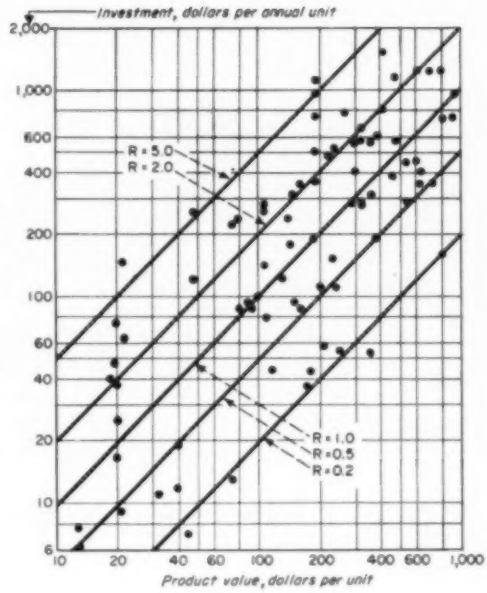
The diagonal lines in the graph, drawn at a slope of 1.0, represent various values of the capital ratio, *R*. This useful index is the ratio of plant investment to product value for a particular chemical commodity. (The inverse of *R* is commonly referred to as the turnover ratio.)

No rigorous correlation is indicated because of the wide scattering of points. Lower values of *R* in general apply to inorganic chemical plants with well-established processes, whereas new processes and organic chemical plants in general show higher values of *R*. However, differences in chemical nature alone do not explain the wide variations in capital required for plants producing materials of the same product value. One or more of the following factors should be considered as affecting the scattering of points:

1. Plant costs, although considered to be for commercial sizes, are assumed constant per unit of production regardless of capacity. This is probably true only for a few plants. Chilton[2] has shown that the cost may vary as the 0.33 to 1.0 power of capacity for a given type of plant. Thus, a given point may be at either the low or high end of the commercial range. This would produce some variation in the capital investment.

2. Cost data may be for complete new plants or they may be for investments where a new process facility is merely added to a going plant. All the data would not be directly comparable.

3. The nature of the process will cause scattering. For example, in butadiene plants, a low cost primary raw material involving a completely integrated process requires a higher investment than for the case where a high-priced intermediate is purchased as the raw material and then converted to the final product by a simpler process. The product in either case sells for the same price; for the completely integrated process the higher fixed costs are balanced by lower raw material costs.



4. In many plants part of the investment is used for processing by-products. To get the complete story, the values of by-products should be prorated and added to the values of the major products.

5. For new processes and products the investments always tend to be high, and established production practices would eventually lower some investment costs. This effect would be compensated in part by lowered product prices in order to meet competition and increase sales.

6. Some of the investment cost data shown are for plants built during World War II, when the most economical procedures were sacrificed in order to meet military demands as rapidly as possible.

7. Finally, many companies are reluctant to divulge exact investment figures.

In spite of all these factors, some of which may be compensating, a simple counting of the points on the graph shows that the number above $R = 1.0$ is almost exactly balanced by the number of points below. This evidence seems to confirm the approximation that one dollar of plant investment is required for each dollar of annual sales. This relation should hold for any year where the relative changes in construction costs and product prices are equal.

It is not implied that this relation can be used in place of careful cost estimates. However, any plant investment might be expected to fall reasonably close to the composite average if consideration is given to all the possible variables.

H. E. SCHWEYER is with the Engineering and Industrial Experiment Station of the University of Florida, Gainesville.

REFERENCES

1. Anon., *Chem. Eng.*, May 1951, pp. 164-5.
2. Chilton, C. H., *Chem. Eng.*, April 1950, pp. 112-4.
3. Nichols, W. T., *Chem. Eng.*, June 1951, pp. 248, 250.
4. Tyler, C., "Chemical Engineering Economics," 2nd ed., p. 51, McGraw-Hill Book Co., 1933.

Sulphur from the ground is now being supplemented by sulphur from sour gases as shown by these two types of operation of Texas Gulf Sulphur Co. Part of the Worland, Wyo., gas-to-sulphur plant is at the right.

SULPHUR

During the last year sulphur, because of the shortage, rated more comment than any other commodity. Now that we have had time to survey the situation, what does it really mean—and what can we do about it? This report tells.

CHEMICAL ENGINEERING REPORT—JANUARY 1952

Sulphur is short! That is a fact that has been self-evident for the past two years. During 1950 we were wondering just how bad the shortage might become, and what to do about it. During 1951 we learned how bad the shortage was, and we did a good deal toward correcting it. Unfortunately, there is an inevitable lag between starting corrective measures and having them become effective. So it will be 1953—or even later—before supply can catch up with demand. We and the rest of the free world could have used about 1,400,000 tons more sulphur in 1951. In 1952 the discrepancy according to the International Materials Conference may be as great as 1,750,000 tons.

Exports make the difference

Our original statement needs qualification in two particulars if we are to understand the long-run sulphur situation. As the first qualification, let us point out that there is even now enough sulphur being produced in the United States to keep up with our own domestic demands. The catch lies in the fact that, in our own interest, we must continue to gear the free world's defense machine. The existing sulphur gap comes from our exports to Canada and the rest of the world—1,479,000 tons in 1950; about 1,315,000 tons in 1951. As the second qualification, we must note that the shortage exists in cheap and easily available sulphur—not total sulphur in all forms. Actually, there is plenty of sulphur for now and for the indefinite future—in reserves of sulphides, sulphates and low-grade native sulphur ores. But these are not cheap sources and they are not all easily available. Still, they are the sources on which eventually we will have to depend when salt-dome reserves of Frasch-minable brimstone have been exhausted, in perhaps 25-30 years.

Sulphur, sulphides, sulphates

When we speak of total sulphur demand, even now we are not thinking exclusively of Frasch-minable native sulphur. Sulphides, and to a small extent sulphates, have been supplying a part of the demand for a long time. In 1910 only about 5 percent of the sulphur demand was met by brimstone, from Sicilian sources and from the infant Frasch-process industry on our own Gulf Coast. The rest came from pyrites and to a small extent from SO_2 in smelter gases. However, with the development of the cheap Texas-Louisiana brimstone supplies, more and

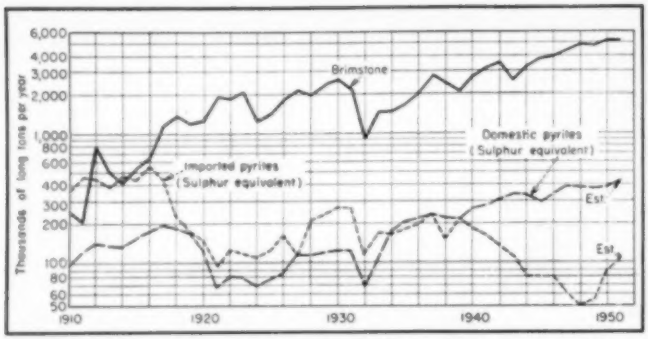


Fig. 1—How Frasch sulphur and the equivalent sulphur content of imported and domestic pyrites have trended since 1910. The brimstone curve represents production.

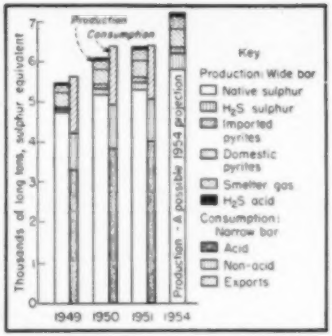


Fig. 2—Our total use of sulphur in U. S. came from these sources in 1949-1951.

more of the world's demand was satisfied by brimstone. In the five years before World War II, half of the sulphur demand of the world came from pyrites, about one-third from brimstone, and one-tenth from waste SO_2 and H_2S in gases.[1] About 1 percent came from sulphates. But the 1940 decade changed all that. Brimstone and pyrites switched places, with brimstone supplying over half of a demand that had increased in 1950 by 40 percent, and pyrites supplying only a third. Waste sulphur-containing gases had increased a little tonnagewise, but had fallen in percent. Sulphate usage had increased slightly, to something under 2 percent.

Brimstone is cheaper

This then was the problem: with U. S. brimstone at $16-18 at the mine (now $21-$22), many of the world's acid plants and paper mills had turned away from pyrites, toward brimstone. A brimstone-burning acid plant costs roughly half as much as a pyrites plant, and its operation is easier and cheaper. Therefore, most new acid plants were designed for brimstone. Consequently, the high-cost, low-grade native deposits of Italy's mainland and Sicily had fallen largely into disuse. Spain's pyrites mines had suffered similarly. Only in North America had the use of pyrites gained, both in tonnage and percentagewise.

In 1950 the shortage

Although the U. S. salt dome producers were thus able to meet all of the increasing demands until 1950, it had long been obvious that their deposits could not last indefinitely. However, nobody but the four brimstone producers thought of this. In 1947 the first danger signals appeared when mine stocks started to fall as shipments began to exceed production. And before the end of 1950, the producers found it necessary to practice a limited allocation. Where mine stocks formerly were generally about a two-years' supply, by the end of 1950 they had fallen to the irreducible minimum of a six-months' supply, and the problem was beginning to become intensified to brimstone users throughout the world.

Prior to 1950, of over 200 salt domes that had been prospected, only 12 had become major sulphur producers, and of these five had played out, as in Table I. The seven remaining deposits were being worked at maximum rates. Furthermore, with all the oil exploration that the Gulf coastal area had seen, the prospects for much new discovery were not especially rosy.

Sulphur search resumed

Then, in 1950-1951, brimstone producers began actively to prospect the more hopeful domes. Exploration in a number of Gulf areas in Mexico gave rise to considerable publicity, but not much sulphur. Farther north along the Gulf, in the United States, Texas Gulf Sulphur Co. (which had spent $11 million in 1948-1950 on exploration and expansion) started a 50 percent expansion of capacity at its Moss Bluff, Tex., dome. This will be ready for operation probably late in 1952. The same concern started development of the oil-famous Spindletop Dome in Texas, and expects to be producing there during the first half of this year. Jefferson Lake Sulphur Co. brought Starks Dome, La., into production during 1951. Meanwhile, Freeport Sulphur Co. announced plans to operate at Bay Ste. Elaine and Garden Island, La. Bay Ste. Elaine, in the Louisiana bayou country, is under water or marshy land and so involves an amphibious operation with a barge-mounted power plant and other equipment. It is expected to be in operation late in 1952. Garden Island, close to the mouth of the Mississippi delta, offers similar difficulties, but is hailed as the largest new development in 20 years. Freeport is leasing this dome from The Texas Co., and will share profits equally with the oil concern. Freeport expects to spend $10-15 million on its development, and to be in production at this point during 1953.

New mines coming in

These four new domes, plus the expansion at Moss Bluff, are estimated to produce a total of about 1,200,000 long tons of brimstone per year. Assuming continued operation of the seven previously operating domes at the 1950 rate of about 5,200,000 long tons per year, it would appear that 1954 native brimstone production could go to 6,400,000 tons and thus come fairly close to filling the gap in the likely world demand. Unfortunately, such an assumption is not possible. Several currently producing mines are expected to fall off and may even be depleted by 1953. The gap can be filled only with alternate sources. And regardless of whether the salt-dome reserves

may be good for 20 years or for longer at something approaching the present production rate, it is obvious that we are dissipating an irreplaceable resource. When the price-fixed $21 sulphur is gone the more expensive sulphides and sulphates will have to take over.

It is inevitable that long before our dome sulphur is finally exhausted, prices will have to rise in order that encouragement may be given to the more extensive use of alternates, and to the less wasteful use of brimstone and sulphuric acid. Meanwhile, until the development of alternates and the opening of the new Frasch-process mines have bridged the gap between supply and demand, economy in sulphur usage throughout the world is the only possible course.

NPA forces sulphur savings

As the first official step in economy, the National Production Authority put brimstone under export allocation at the beginning of 1951. After various revisions of the export quotas, the total finally ran about 1,315,000 tons, of which 357,000 tons went to Canada. In April, under Order M-45, the NPA put sulphuric acid under limited allocation so far as the 11 Western States were concerned. Under NPA order M-69, in June all but the smallest users in the U. S. were restricted on monthly sulphur usage to 100 percent of their average monthly rate in 1950, and to a three-months' inventory. After July 1 sulphur producers were required to make deliveries only on specific authorization by NPA. In October Defense Production Authority announced that it expected soon to issue further restrictions, allowing only a 25-day inventory and 90 percent of 1950 use. The first part of this program, that is, restriction to a 25-day inventory, went into effect on November 9 through an amendment to NPA order M-69. Some flexibility was allowed to take care of special shipping problems. Then in a second amendment to M-69, the restriction to 90 percent of 1950 use was put into effect as of January 1, 1952, with a loophole for special cases and defense industries.

Economy, alternates are musts

All this means that continued development of the sulphur-using industries depends today on both economy and the fullest possible development of alternate sulphur sources, and sulphur or sulphuric acid substitutes. ECA has been encouraging the development of alternate sources in the ECA countries, but this takes time, as it does in the United States. Here, NPA has been offering encouragement by issuing certificates of necessity to those who wish to shift to pyrites or to produce sulphur from sour gases. Throughout the world the response has been considerable and something like a 25 percent increase in capacity of native and alternate sulphur sources is possible by 1953, as a comparison of Tables II and III with Table IV will show. However, against this there remains the lure of cheap Frasch sulphur. Not unnaturally, sulphur users are inclined to hold off on the development of alternate sources, hoping that an eventual growth in world output, or a lessening in demand, will avert the need for going to the more expensive sources in sour gases, pyrites, smelter fumes or calcium sulphate. Possibly there may be some temporary alleviation by next year, but this is likely to be fairly short lived. For the longer look ahead, a continued turn toward alternate sources is much to be desired.

Table I—Principal U. S. Sulphur Domes

Dome	Producer*	Started	Present Status† (Ex = Exhausted)
Sulphur, La.	Union	1895	Ex 1924
Bryanmound, Tex.	Freeport	1913	Ex 1935
Big Hill, Tex.	Texas Gulf	1919	Ex 1936
Hoskins Mound, Tex.	Freeport	1923	Operating
Palangana, Tex.	Duval	1928	Ex 1935
Boling Dome, Tex.	Texas Gulf	1929	Operating
Long Point, Tex.	Jefferson Lake	1946†	Operating
Lake Pleigneur, La.	Jefferson Lake	1932	Ex 1936
Grande Ecaille, La.	Freeport	1933	Operating
Clemens Dome, Tex.	Jefferson Lake	1937	Operating
Orchard Dome, Tex.	Duval	1938	Operating
Moss Bluff, Tex.	Texas Gulf	1948	Operating
Starks Dome, La.	Jefferson Lake	1951 (Mid)	Operating
Spindletop Dome, Tex.	Texas Gulf	Not yet	Start early '52
Bay Ste. Elaine, La.	Freeport	Not yet	Start late '52
Garden Island, La.	Freeport	Not yet	Start '53

* Union Sulphur Co., Freeport Sulphur Co., Texas Gulf Sulphur Co., Duval Sulphur & Potash Co., Jefferson Lake Sulphur Co.
† Another part of this dome was operated 1930-38 by Texas Gulf.

Balance by 1953?

What sort of sulphur demand may we expect in the future? Before World War II, the upward trend for many years had averaged 3 percent per year. From 1940 until the present, the increase has averaged about twice that. For 1953 the Office of Defense Mobilization assumes continuation of the present business boom and projects the U. S. domestic demand for sulphur and sulphur equivalent from all sources to 5,770,000 long tons, not including 1,450,000 tons for export. If all projected plans are carried through, it is likely that this demand can be met. Tables II and III summarize what is known of the contemplated free-world picture of expansion. Table III shows 28 definite or fairly definite projects in the United States, including five on native salt-dome sulphur, two on low-grade sulphur, 16 on sour refinery and natural gases, two on pyrites and two on smelter gases. Shown also are 12 "probables," including six on sour gas, one on low-grade surface sulphur, one on pyrites, four on sulphide ores, and one on sludge acid. New Frasch capacity is projected at 1,180,000 long tons annually, new non-Frasch capacity at 390,000 tons, plus the "probables" at 334,000 tons. Not including the "probables" this could bring total U. S. capacity in 1953 to as high as 7,600,000 long tons from all sources, of which about 80 percent would be Frasch process sulphur. For the rest of the free world, 1953 may bring a total capacity of around 6,000,000 long tons, mostly from pyrites and other sulphides ores. However, it is quite probable that many of the projected increases are highly optimistic.

Where U. S. gets its sulphur

The United States in 1950 produced about 56 percent of the free world's sulphur needs from all sources (see Table IV), supplied over 59 percent (by drawing on stocks), and consumed 45 percent. Therefore, it is instructive to see how the United States gets its total sulphur (Fig. 2), and for what purposes it uses it. Table V shows our estimates of the U. S. sulphur balance for 1949 to 1951. Data for 1951 are preliminary and subject to later revision. In 1950, however, we produced nearly 5,200,000 long tons of native sulphur (including perhaps 5-8,000 tons from low-grade deposits in Colorado and Nevada). In addition, we recovered 142,000 long tons of brimstone from sour gases, and pro-

Table II—New Sulphur Equivalent Capacity by Countries, Added 1951–1953 (Except U. S.)*

(From various sources, long tons of sulphur equivalent)

Company	Location	Sulphur Source	Est. Annual Capacity
Australia			
4-company combine	Nairne	Pyr.	30,000
Canada			
Abitibi Paper Co.	Ontario	Pyr.	5,000
Alum. Co. Canada	Quebec	Zn conc.	21,000
Bowater NF. Pulp	NF	Pyr.	13,000
Canad. Ind. Ltd.	Copper Cliff, Ont.	Sm. gases	45,000
Columbia Cellulose	Brit. Columbia	Pyr.	13,000
Consol. Mining	Trail, B.C.	Pyr. tail.	60,000
Consol. Paper	Quebec	Pyr.	5,000
Donnaconna Paper	Quebec	Pyr.	7,000
Price Bros.	Quebec	Pyr.	5,000
Royalite Oil Co.	Alberta	Nat. gas	10,000
Shell Oil Canada	Alberta	Nat. gas	10,000
Canada total			194,000*
Colombia			
Ind. Purace, S. A.	Polayan	Surface S.	10,000
Ecuador			
Chem. Plants Corp.	Titan	Surface S.	?
Japan			
Dowa Mining Co.		Pyr.	13,000
Various		Nat. S.	100,000
Japan total			113,000
Mexico			
AS&R	San Luis Potosi	Sm. gas	3,000
Guanos y Fert.		Nat. gas	22,000
Guaxcama Mine	Cerritos	Surface S.	12,000
Petroleos Mex.	Poza Rica	Nat. gas	50,000
Mexico total			87,000*
Norway			
Elektro Kjemish.	Skovaras	Pyr.	75,000
So. Africa			
Daggafontein	U. So. Africa	Pyr.	25,000
West Rand	U. So. Africa	Pyr.	5,000
West Reefs	U. So. Africa	Pyr.	25,000
Africa total			75,000
Spain			
Rio Tinto Min. Co.	Huelva Prov.	Pyr.	200,000
Tharsis S & Cu Co.	Huelva Prov.	Pyr.	200,000
Spain total			400,000
Un. Kingdom			
Esso Petrol. Co.	Fawley	Ref. gas	12,000
11-company combine	Widnes	Anhydrite	50,000
Imp. Chem. Ind.	Billingham	Exp. anhyd.	25,000
Sandilands Chem.	Scotland	Pyr.	12,000
Shell Oil Co.	Stanlow	Ref. gas	18,000
U. K. total			117,000
Grand total			1,101,000*

* Other new capacity which has been discussed, but is believed by trade opinion to be uncertain of going into effect includes Noranda Mines Ltd., in Quebec, 52,000 annual tons of elemental S and H_2SO_4-fixed sulphur from pyrites; Mexican Gulf Sulphur Co., Tehauntepec, 200,000 annual tons by Frasch process in Mexico; and a proposed expansion of Italian mainland and Sicilian sulphur from native ores of 250,000 annual tons sulphur. In some cases there may be a little duplication in this table in showing pyrites consumers who may use some of the new pyrites production indicated.

duced sulphuric acid from pyrites, smelter fumes and oil refinery H_2S equivalent to another 757,000 long tons of sulphur. Total disappearance of sulphur in all forms amounted to about 6,409,000 long tons, made up of 1,479,000 tons exported, and about 4,930,000 tons consumed domestically. Of the domestic consumption, 22 percent or 1,082,000 tons was used direct as brimstone or SO_2, while 78 percent or 3,848,000 tons was converted into 12,060,000 short tons of sulphuric acid. Thus, in 1950, our total sulphur equivalent (domestic plus exports) came from native sulphur current production, 81.0 percent; native sulphur stocks, 6.0 percent; H_2S sulphur, 1.2 percent; and pyrites, smelter fume and H_2S acid, 11.8 percent. This total was distributed 23.0 percent to export; 16.9 percent to domestic non-acid uses; and 60.1 percent to new domestic sulphuric acid.

Frasch over 80 percent

Acid that recycles

The question of how much sulphur goes into refortified sulphuric acid, as distinguished from new acid, and how much acid is re-used as is, concentrated, or reconstituted, is one that has never been entirely satisfactorily settled. NPA[2] has estimated the total recycle of acid at 2,062,000 tons in 1950. Therefore, in Table VII we have recast our acid distribution estimates to include the use of both new and recycled acid.

Who uses sulphur and acid?

Approximate distribution of sulphur among the six main classes of non-acid users is shown in Table VI, from which it is clear that by far the largest user is wood pulp, both sulphite and kraft —with some 38 percent of the non-acid total. Similarly, agricultural chemicals is by all odds the top user of sulphuric acid, as Table VII clearly shows. Again, taking the more accurate figures of 1950, in which some 12,060,000 tons of new acid and 14,120,000 tons of total acid was consumed, the acid used for superphosphate plus ammonium sulphate ran to 37 percent of the total. In terms of sulphur, through its consumption of fertilizers, insecticides and fungicides, agriculture in 1950 consumed more than 27 percent of the entire domestic sulphur equivalent supply.

How 1951 stacked up

Speaking for the preliminary 1951 estimates, the total sulphur equivalent produced in the United States from all sources, appears to have been about 6,400,000 long tons. It is estimated that this supply came from native sulphur, 82.8 percent; H_2S sulphur, 200,000 tons or 3.1 percent; and pyrites, smelter fume and H_2S acid, 14.1 percent. Consumption of about 6,380,000 tons of sulphur equivalent is estimated at 20.6 percent to exports; 16.8 percent to domestic non-acid uses; and 62.8 percent to new domestic sulphuric acid.

By 1953 this picture will probably have changed to a small extent with the total sulphur equivalent probably equal to about 80 percent native dome sulphur; 6 percent H_2S sulphur; 0.3 percent native sulphur from low-grade ores; and 13 percent as acid from pyrites, smelter fume and H_2S.

Prospects, but not many

It is clear that, any way you look at it, as long as Frasch process sulphur remains cheap and relatively plentiful, it will be called on to carry the great bulk of the load. Some time between now and say 1975, it will no longer be cheap and plentiful. Certainly, there will be other discoveries, perhaps in Mexico, perhaps in South America, a few more no doubt in Texas and Louisiana. Freeport Sulphur Co., for example, has four prospects, of which it is drilling two, but not too hopefully. Texas Gulf is interested in various Texas possibilities, and is carrying on one of the Mexican explorations, but again the prospects do not appear especially good. It is probable that there may be considerable sulphur under the continental shelf of the Gulf of Mexico, but here the practical difficulties of production, perhaps far from land, are much more of a problem than in producing oil under similar circumstances. This is because of the need of a large power plant, fresh water supply and water-treatment plant at the well site, none of which are needed for oil production. Protection of such

equipment against Gulf hurricanes is a problem no one is anxious to try to solve.

No more bonanzas

It is considered highly unlikely that future discoveries will prove to be bonanzas comparable to the domes now producing or exhausted. So it may not be many years before Frasch sulphur inevitably must assume a less dominant role. To what raw materials can we turn when that day comes?

Actually, all of the potential sulphur-bearing materials are already in use, so that even now we have had some experience in seeking economical means of extracting their values. Roughly, their plentifulness is in inverse proportion to the cost of recovering their sulphur content. They include (1) pyrites, of which large and almost unlimited supplies are widely distributed throughout the world; (2) low-grade native sulphur, also widely distributed, but often not in sufficient quantity or concentration to justify recovery; (3) sulphide ores of gold, copper, lead, nickel and zinc which, unhappily, are being rapidly depleted in many locations; (5) the calcium sulphates, gypsum and anhydrite; and (6) coal. Coal sulphur occurs

What are the alternates?

Table III—New Sulphur Equivalent Capacity in U. S., Added 1951-1953

(From various sources, long tons of sulphur equivalent)

Salt Dome Sulphur

Producer	Location	Expected Date	Est. New Capacity
Jefferson Lake	Starks Dome, La.	Op. mid. '51	80,000
Texas Gulf	Spindletop Dome, Tex.	1st half '52	300,000
Texas Gulf	Moss Bluff, Tex.	Expan. late '52	150,000
Freeport	Bay Ste. Elaine, La.	Late '52	150,000
Freeport	Garden Island, La.	1953	500,000
Total salt dome sulphur			1,180,000

Hydrogen Sulphide Sulphur (Including Present Plants and Acid)

Producer	Location	Builder,* Start Op.	Source	Est. Annual Capacity—Present	Est. Annual Capacity—New (not operating)
Army Ordnance	Morgantown, W. Va.	(3) 1949	Coke oven gas	9,000	10,000
Consol. Chem. Ind.	Baton Rouge, La.	(6) 1952	Ref. gas	———	———
Freeport S Co.	Westville, N. J.	(4) 1949	Ref. gas	9,000	———
Genl. Chemical	El Segundo, Calif.	Exp. 1952	Ref. gas	50,000†	23,000†
	Richmond, Calif.				
Gulf. Ref.	Pt. Arthur, Tex.	(6) 1952	Ref. gas	———	21,000
Gulf. Ref.	Waddell, Tex.	(5) 1952	Nat. gas	———	7,000
Hancock Chem.	Long Beach, Calif.	(1) 1948	Ref. gas	19,000	———
		(6) 1952	Ref. gas	———	16,000
Lyon Oil	Magnolia, Ark.	(5) 1951	Nat. gas	———	3,500
Mathieson Chem.	McKamie, Ark.	(2, 3) 1944	Nat. gas	35,000	———
		(2) 1952	Nat. gas	———	17,000
Mathieson Chem.	Magnolia, Ark.	(3) 1945	Nat. gas	21,000	———
Phillips Chem.	Crane Co., Tex.	(6) 1952	Nat. gas	———	17,000
Phillips Chem.	Goldsmith, Tex.	(6) 1952	Nat. gas	———	35,000
Sid Richardson	Odessa, Tex.	(5) 1952	Nat. gas	———	7,000
Shamrock Oil	Sunray, Tex.	(2) 1951	Nat. gas	———	10,000
Shell Chem.	Deer Park, Tex.	(6) 1952	Ref. gas	———	17,000
Sinclair Ref.	Marcus Hook, Pa.	(6) 1952	Ref. gas	———	7,000
Std. Oil Ind.	Whiting, Ind.	(2) 1952	Ref. gas	———	17,000
Stanolind Oil	Elk Basin, Wyo.	(1) 1949	Nat. gas	23,000	———
Stanolind Oil	Sundown, Tex.	(2) 1952	Nat. gas	———	15,000
Stauffer Chem.	Torrance, Calif.	.....	Ref. gas	10,000†	———
Texas Gulf	Worland, Wyo.	(3) 1950	Nat. gas	100,000	———
Union Oil	Wilmington, Calif.	.....	Ref. gas	———	21,000
Present hydrogen sulphide total				276,000	
New hydrogen sulphide total					243,500
Total hydrogen sulphide				519,500	

Other New Sources (Equivalent Tons S)

Producer	Location	Source	Est. Annual Capacity
Bethlehem Stl. Corp.	Sparrows Point, Md.	Pyr.	36,000
Brown Co.	Berlin, N. H.	Pyr.	9,000
Bunker Hill & Sullivan	Kellogg, Idaho	Sm. gas	25,000
Consol. Chem. Ind.	Baton Rouge, La.	Spent acid	43,000
Cont. S & Phos. Co.	Cody, Wyo.	Surface S.	10,000
Garfield Chem. Co.	Garfield, Utah	Sm. gas (expansion)	25,000
Wyo. Gulf S Co.	Cody, Wyo.	Surface S	8,500
Other total			146,500
Grand total U. S., new sulphur equiv.			1,570,000
Grand total, free-world new sulphur equiv.			2,671,000

U. S. "Probables" (Equivalent Tons S)

Producer	Location	Source	Est. Annual Capacity
Cities Serv. Ref. Co.	Lake Charles, La.	Ref. gas	14,000
Humble Oil Co.	Baytown, Tex.	Ref. gas	(?)17,000
Phillips Chem. Co.	Eunice, Tex.	Nat. gas	35,000
Stanolind Oil	Silvertip, Wyo.	Nat. gas	35,000
The Texas Co.	Pt. Arthur, Tex.	Ref. gas	9,000
Acid plant	Texas	Sludge acid	65,000
Three acid plants	Various	Zn conc.	56,000
Acid plant		Cu conc.	10,000
Acid plant	Nevada	Surface S.	50,000
Acid plant		Pyr.	43,000
Total U. S. Probables			334,000

* (1) E. B. Badger & Sons Div., Stone & Webster Eng. Corp.; (2) Fluor Corp.; (3) Foster Wheeler Corp.; (4) The Girdler Corp.; (5) Graff Eng. & Const. Co.; (6) Ralph M. Parsons Co. † Makes acid from H_2S.

both in organic and in pyrite form and can be recovered quite readily in coal carbonization plants. A part of the pyrite content can be recovered in coal washeries at a fairly high cost, and has been so recovered as "coal brasses" both here and abroad. However, the great bulk of the sulphur in coal is inevitably lost to the atmosphere through combustion. As yet, no one is optimistic enough to predict eventual widespread recovery from stack gases. At least for the present, pyrites and sour hydrocarbon gases appear to be the best potential sources, although the quantities of sulphur available in smelter gases and calcium sulphate would be very large if economical recovery methods could be developed.

Sulphur from sour gases

Although H_2S in natural and petroleum gases is by no means our most permanent sulphur reserve, it is one which is attracting most of the present-day attention in North America. In the United States at present there are nine plants for making elemental sulphur from H_2S, totalling a capacity of about 680 tons of brimstone per day. Two of these and one sizable expansion went into operation during 1951. One, the Army Ordnance plant at Morgantown, W. Va., is not operating. Ten more plants are expected to be in operation during 1952, plus expansion of one existing plant. By the end of 1952 the total of rated capacity should be about 1,250 tons of brimstone per day. However, this total may be somewhat too low, since there are at least half a dozen plants under consideration, some of which may be built during this year. If all were built, the total capacity could be as high as 1,700 tons per day, or potentially from 500,000 to 600,000 tons per year. Potentially as high as 10 percent of our brimstone requirements, this H_2S development constitutes a good hedge against the future.

It should be emphasized, however, that rated capacities of H_2S plants are often in excess of actual production due to insufficient gas supply so that in appraising the future picture, rated capacities should probably be scaled down.

Sulphuric acid from sour gases

Actually, plants that make brimstone from H_2S are not the only ones recovering sulphur from sour gas. Three acid plants in the west are believed to have a present capacity of somewhere around 170 tons of sulphur equivalent per day. Expansion of one of these plants is likely to raise the total to about 230 daily tons, or 80,000 tons of sulphur equivalent per year. Three plants in the east are also understood to use H_2S but the amount is small.

Mexico and Canada, too, are interested in H_2S sulphur. Two small plants totalling 20,000 tons per year are under construction in Canada, and two medium-size plants totalling about 70,000 tons annual capacity are already operating in Mexico.

It is impossible to estimate just how far the recovery of sulphur from H_2S may go if potential producers receive enough encouragement. At present delivered prices of Frasch process sulphur, it is generally considered that an H_2S plant can break even at 20-30 tons per day, and can be profitable if its output is 50 tons. However, when sulphur prices rise, small plants will become attractive, perhaps even down to 5 or 10 tons. Against the straight economics of producing H_2S sulphur in competition with Frasch sulphur, there is the element of security against short sulphur supplies and the further prospect that an H_2S producer can get more sulphur than government regulations would otherwise allow. This supplies an additional and often important inducement. As NPA now interprets the situation, a producer of mined or recovered sulphur need not count his captive sulphur production against his 90 percent-of-1950 quota, provided that his sulphur producing facilities went into operation since June 24, 1950. He may use such sulphur for any purpose within a calendar month but must use it himself, or it must be used by the person who owns the material from which the sulphur is recovered. This prevents both stockpiling and uncontrolled sales.

Advantage of captive sulphur

Table IV–Estimated 1950 Sulphur Production in all Forms, Free-World Countries*

(Thousands of long tons, sulphur equivalent.)

	Native Sulphur	Other Elemental†	Pyrites	Sulphur in Gases	Sulphates	Total
North America						
U. S.	5,196	142	479	278	——	6,095
Other	4	——	142	125	——	271
Total	5,200	142	621	403	——	6,366
South America	31	——	2	——	——	33
Europe						
Italy	229	——	399	——	——	628
Scandanavia	——	110	479	5	——	594
Spain	4	37	582	——	——	623
U. K.	——	5	7	145	175	332
Other	21	45	911	280	——	1,257
Total	254	197	2,378	430	175	3,434
Africa	——	——	42	8	——	50
Asia						
Japan	100	——	709	50	——	859
Other	17	11	7	——	——	35
Total	117	11	716	50	——	894
Oceania	——	——	42	35	——	77
Grand total	5,602	350	3,801	926	175	10,854

* With some modifications for U. S., based on J. C. Carrington, paper before Ind. Minerals Div., A.I.M.E., Morgantown, W.Va., Sept. 14, 1951.
† Estimated to include 167,000 tons elemental sulphur from pyrites.

Table V–U. S. Sulphur-Sulphuric Acid Balance, Estimates for 1949-1951*

(Thousands of tons, sulphur and pyrites in long tons, acid short tons.)

	1949 (Revised)	1950 (Revised)	1951 (Prelim.)
Sulphur mined (Frasch)†	4,745	5,188	5,300
Approx. year-end stocks at mines	2,650	2,388	2,700
Approx. mine shipments	4,789	5,505	4,990
Sulphur from H_2S, produced	57	142	200
Sulphur from H_2S, shipped	42	79	190
Total appar. shipments	4,831	5,584	5,180
Exports	1,431	1,479	1,315
Appar. domestic shipments	3,400	4,105	3,865
Change in users' stocks	−150	−68	−300
Non-acid uses	900	1,082	1,070
Sulphur for acid	2,650	3,091	3,093
Acid from sulphur	8,630	9,690	9,700
Pyrites imports	121	209	250
Domestic pyrites	885	931	1,050
Acid from pyrites	1,405	1,500	1,800
Acid from smelters	373	740	900
Acid from H_2S	120	130	200
Total new acid made	10,728	12,060	12,600

* Data for 1949 and 1951 are *Chemical Engineering* estimates; data for 1950 conform as closely as possible to data released by NPA in paper by Frederic Arden before CMRA, Wilmington, Del., Dec. 13, 1951.
† Do not include 5,-8,000 tons per year mined in west.

Table VI—Principal Non-Acid Uses of Sulphur in U. S., Estimates for 1949-1951*

(Thousands of long tons.)

	1949	1950 (Revised)	1951 (Prelim.)
Wood pulp	345	416	410
Carbon bisulphide	190	191	190
Other chemicals, dyes	95	100	100
Insecticides, fungicides	125	140	135
Rubber	60	75	75
Other	125	160	160
Totals	900	1,082	1,070

* Data for 1949 and 1951 are *Chemical Engineering* estimates; data for 1950 conform as closely as possible to NPA data, see Table V.

Table VII—Estimated Distribution of Sulphuric Acid Used in U. S., 1949-1951, Including Recycled Acid.*

(Thousands of short tons, 100 percent acid.)

Industry	1949 (Revised)	1950† (Revised)	1951 (Prelim.)
Fertilizers			
Superphosphate	3,400	3,800	3,950
Ammonium sulphate	1,300	1,450	1,500
Chemicals	3,200	3,625	3,900
Petroleum refining	1,310	1,500	1,550
Paints, pigments	1,120	1,270	1,250
Rayon and film	625	700	710
Iron and steel	900	1,050	1,090
Other metallurgical	170	190	200
Industrial explosives	100	115	115
Textile finishing	35	40	40
Miscellaneous	340	380	395
Totals	12,500	14,120	14,700

* Recycled acid including re-used acid, concentrated, fortified and reconstituted acid is estimated at 1,800,000 tons in 1949, 2,060,000 tons in 1950, and 2,100,000 tons in 1951.

† Data for 1949 and 1951 are *Chemical Engineering* estimates; data for 1950 conform as closely as possible to NPA data, see Table V.

Another inducement of a somewhat negative sort is the pressure being put by communities and public health authorities on petroleum refineries and natural gas cleaning plants which are presently flaring their waste H_2S-containing gases. There are no reliable estimates of the quantity of H_2S being wasted in this way, but it is large, probably greatly exceeding the amount that will be recovered by 1953. Much of it at present is being flared from many small gas-cleaning plants in quantities that are too small for economical recovery.

Sulphide in natural gas

All natural gas contains some sulphur as H_2S and for pipeline purposes must generally be brought down to not over 2 grains H_2S per 100 SCF. Some natural gases run very high. A west-Texas well recently brought in contains 44 percent H_2S, while the gas supplying Texas Gulf Sulphur Co.'s big plant at Worland, Wyo., runs 30 percent. However, these figures are exceptional. Still, the theory has been advanced that the more sulphurous gases are being held in reserve against the day when sweeter gases are exhausted. So it is likely that the average sulphur content may run higher in the future. Against this optimistic thought, of course, is the question of how long our natural gas will last at the present accelerating rate of consumption. It would not be conservative to expect much sulphur from this source for more than 20-25 years, or about the life of the Frasch deposits.

Sulphur from petroleum

Petroleum itself is a large sulphur source, and Thomas Tait,[8] of Anglo-Iranian Oil Co., has estimated that annual world production contains some 5.3 million long tons. Of this, 2.6 million is contained in oil produced in North America. Not all of this sulphur is vented as H_2S, however. Catalytic cracking converts about 30 percent, and thermal cracking about 20 percent of it to H_2S. Crudes vary widely in their sulphur content, but assuming an average of 2.5-3 percent of sulphur, W. L. Nelson[9] has estimated that it requires about 1,000 bbl. daily of cracking capacity to produce 1 daily ton of sulphur. If a process should be found that could remove the greater part of the sulphur from petroleum in recoverable form and at reasonable cost, it is a safe guess that it would be widely adopted by petroleum refiners throughout the world, and that it could become an extremely important adjunct source of sulphur.

Sulphide plus dioxide

Conversion of hydrogen sulphide to sulphur is an old process involving the catalytic reaction over bauxite of H_2S and SO_2 in a converter named the Claus kiln after its original German inventor. If only H_2S is available, one-third of it is burned to SO_2 to permit the reaction $2\ H_2S + SO_2 = 2\ H_2O + 3S$. In cases where SO_2 may already be available, this reaction provides a convenient method of using both gases for sulphur production. There are presently five American construction firms building plants based on the Claus kiln principle, all with slight variations in flowsheet.

Sulphur ex sulphide in U.S.

First U. S. producer of sulphur by this process was the Southern Acid & Sulphur Co. which put its first unit into operation at McKamie, Ark., in 1944. The first of these plants was designed by Foster Wheeler Corp., and erected by the Fluor Corp., and the second both designed and erected by Foster Wheeler.[5] When Southern Acid was later absorbed by Mathieson Chemical Corp., Mathieson continued operation of the plants, later expanding the one at McKamie, and licensing Fluor Corp. to design and build similar plants for other users.

At about the time when Southern Acid was first investigating the process, Texas Gulf Sulphur Co. pilot-planted a similar process at McKamie,[6] but did not put this information to work until it commissioned Foster Wheeler to build the big Worland, Wyo., plant which first operated in April 1950.[7]

A third plant comes in

Late in 1948 Hancock Chemical Co., of Long Beach, Calif., started operation of a 50-ton unit based on the British Simon-Carves process and using refinery H_2S piped to the plant in the amine-water absorbent solution from three adjacent petroleum refineries. E. B. Badger & Sons (Stone & Webster) was the builder. A second unit of similar size was added shortly, and a third H_2S unit is now approaching completion.

During 1949, three more plants were completed, including Stanolind's Elk Basin, Wyo., plant, built by Badger, a small refinery gas unit belonging to Freeport Sulphur Co., at Westville, N. J., built by Girdler Corp., and another small unit for Army Ordnance, built by Foster Wheeler at Morgantown, W. Va. In 1950 the Texas Gulf Sulphur Co.'s Worland unit began producing, as noted.

Last year, 1951, saw the entrance of two more builders into the H_2S race. Ralph M. Parsons Co., of Los Angeles, is building six of the plants

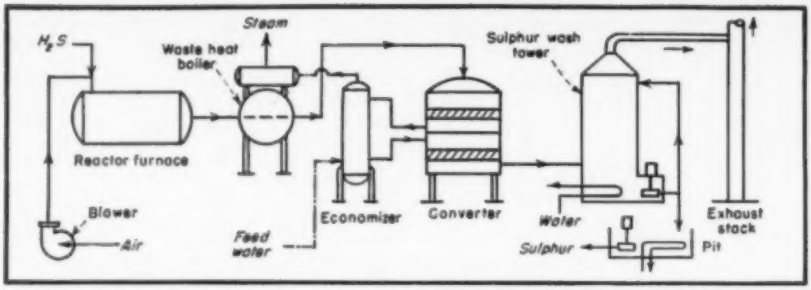


Fig. 3—Simplified flowsheet of typical process for sulphur from hydrogen sulphide as designed by Fluor Corp.

that will be completed in 1952. Graff Engineering & Construction Co., of Houston, completed one plant in 1951 and has two more for completion in 1952. Fluor Corp., Los Angeles, completed one plant in 1951 and will complete two more in the United States and one in Canada during 1952. Foster Wheeler Corp. is building one plant in Canada for 1952 operation and another in England for operation probably in 1953. Badger is understood to be currently inactive in this field. Other firms are also believed to be interested, although not yet ready to offer processes. Among them is Jefferson Lake Sulphur Co.

Processes that clean gas . . .

With the exception of the Jefferson Lake process, which is reported to operate on the unstripped hydrocarbon gas, exhausting a cleaned gas to the pipeline, all H_2S processes require a supply of a concentrated H_2S produced by absorption of this component from the hydrocarbon gas stream. Many processes have been developed for this purpose, using in general weak alkaline solutions which will absorb H_2S when cold, but give it up on heating.[6, 9] The best known of these are the Girbotol (Girdler Corp.) process, using ethanolamines—chiefly monoethanolamine; Shell Development Co.'s, tripotassium phosphate process; the Koppers Co.'s sodium phenolate process, now largely superseded; the Hutchinson process using a combination of monoethanolamine and diethylene glycol (used by Fluor in some applications); and finally the German Alkazid process now being offered in this country by the General Industrial Development Corp., of New York. This last has been used extensively in Germany. In the main these processes remove both H_2S and CO_2, although if it is necessary to absorb H_2S preferentially, this is possible with tertiary amines, with one of the Alkazid solutions, or with the Shell phosphate process.

. . . use simple equipment

All of these processes are set up somewhat similarly, making use of an absorbing tower, where the gas stream is stripped of H_2S and CO_2, and a reactivating tower where the solution from the absorber is regenerated by steam. For heat economy they are liberally provided with heat exchange facilities.

The several variations of the sulphur recovery process now in use are all quite similar except in details. They generally produce sulphur at a purity of about 99.8 percent and operate at 90-92 percent sulphur recovery on a gas containing about 30-40 percent H_2S and up to 60 percent CO_2. Usually they employ a bauxite catalyst in two stages. Catalyst life is long and the catalyst is cheap, if it eventually needs to be replaced. The condensing medium for the sulphur make is generally liquid sulphur which is sprayed into the reaction gases in a wash tower. Operation of such plants is simple and can be made substantially automatic. The principal variations are in the arrangement of the converter stages with respect to the sulphur-condensing equipment.

How sulphur recovery plants are built

Simplified flowsheets of two such processes are shown in Figs. 3 and 4. The first of these is typical of Fluor designs and shows a sequence of reactor furnace, where one-third of the H_2S is oxidized to SO_2, waste-heat boiler, first-stage converter, economizer, second-stage converter, sulphur wash tower, and exit stack. The second, Fig. 4, is the most recent Foster Wheeler design, as used in the Canadian Royalite and English Esso Petroleum Co. installations. Its sequence consists of a reactor furnace, waste-heat boiler, economizer, first-stage sulphur wash tower, gas-fired reheater, single-stage converter, economizer, second-stage wash tower, and exit stack.

In all of these processes, in addition to the primary oxidation reaction of $H_2S + 3/2\ O_2 = H_2O + SO_2$, and the sulphur-forming reaction of $2\ H_2S + SO_2 = 2\ H_2O + 3S$, there is also a secondary reaction of direct oxidation, $H_2S + 1/2\ O_2 = H_2O + S$, which takes place in the reaction furnace. Foster Wheeler finds that it is possible to control furnace conditions to emphasize the sulphur-forming reactions in the furnace and to produce up to about 70 percent of the sulphur at that point. For this reason, the first wash tower directly follows the initial gas cooling equipment. The single converter is thus able to operate on sulphur-free gas and can complete the sulphur-forming reaction at better efficiency per unit of catalyst than in most conventional arrangements. The original Mathieson plant at McKamie, Ark., also a Foster Wheeler design, employed two converters, each followed by a wash tower.

A simpler process

Another variation of the process, the small Graff-designed plant at Lyon Oil Co., combines the reactor furnace and the waste-heat boiler, and uses a single-stage converter with aluminum

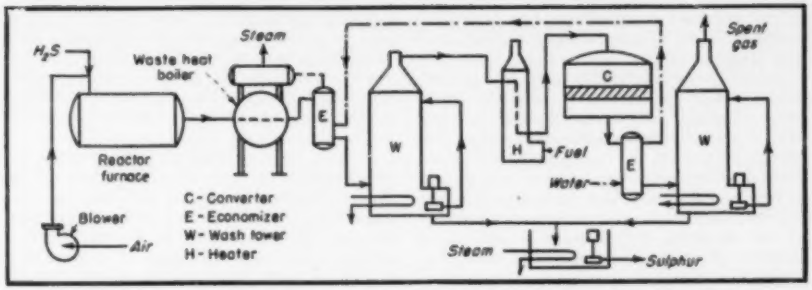


Fig. 4—Simplified flowsheet for sulphur from hydrogen sulphide now being used by Foster Wheeler Corp.

oxide catalyst, and an atmospheric condenser for the sulphur.

Eliminates the gas cleaning

Jefferson Lake Sulphur Co.'s process, which is said to have been pilot-planted, but has not yet been offered commercially, is reported to obtain the necessary SO_2 by burning a part of the sulphur produced. This SO_2 is then reacted at low temperature with the H_2S over a special catalyst. Since the process segregates the oxidation stage from the main gas stream and operates at low temperature, it is claimed to be possible to pass the entire hydrocarbon stream through the process, without previous stripping of the H_2S, and so eliminate the need to operate a gas-cleaning plant.

The economics of H_2S for sulphur production is not entirely clear. A 20-ton-per-day plant is reported to cost about $200,000, exclusive of gas-cleaning facilities, although reported contract prices have varied widely. Operating cost, exclusive of any charge for H_2S, is about $6-7 per ton of sulphur produced. If the H_2S cost is put in at zero, then at $22 per ton the sulphur output will return a gross profit of about $100,000 per year, which will pay for the plant in two years.

Economics of the alternates

As yet there is no very considerable expansion in the use of pyrites for sulphuric acid in the United States. The reason is not far to seek when it is considered that for a 100-ton acid plant producing 98 percent acid, the investment today will be about $600,000 if brimstone is used; about $825,000 if H_2S is the sulphur source, about $1,200,000 if pyrites is burned, and about $1,800,000 if the raw material is gypsum and the products acid and lime. These are rough figures, of course, which may vary considerably with local conditions. For a smaller pyrites plant, the cost may be as high as 2½ times the brimstone plant cost. Looking at the matter from the production cost standpoint, brimstone delivered at $30 per long ton will produce 98 percent acid for about $15 per short ton. For comparison, pyrites delivered at about $20 per ton of contained sulphur makes the acid cost about $19. With gypsum at $2 per ton, gypsum acid would come to about $25.70.

Where pyrites fits in

Actually, we have several acid plants that have been using pyrites for many years. The number has been decreasing but there are still about nine such plants, with the largest acid production centered in Tennessee. Since the war, acid production from domestic pyrites has averaged about 1,200,000 tons per year, and from imported pyrites about 215,000 tons per year. Pyrites (including coal brasses) is produced in eight states, chiefly in Tennessee, Virginia and Montana. Production in Wisconsin was recently reported discontinued. There are no recent estimates of reserves, but a few years ago they were estimated at a total of 75,000,000 tons of sulphur equivalent by the U. S. Bureau of Mines and the Geological Survey.

New roasters for pyrites

Development by the Dorr Co. of its Fluosolids roaster for pyrites is expected to give a considerable boost to pyrites utilization. Throughout the world, Dorr presently has installed or has contracts for 27 such roaster installations, 19 of which are used for SO_2 or acid production. Three plants (five roasters) will make acid in South Africa. Six will supply SO_2 to paper mills in Canada. Another Canadian plant will produce sulphuric acid. Two installations (four roasters) are scheduled for the United States. One will supply SO_2 to a paper mill, the other pickling acid to a steel plant. The last of the acid installations is going up in Japan.

In addition, Dorr considers as "probables" for the United States three acid plants to use zinc concentrates, one to use copper concentrates, a large one to operate on pyrites, and a plant which will roast low-grade (30 percent) sulphur ores for the direct production of acid. The last-named plant may yield as much as 700 tons of acid per day.

What the Fluosolids roaster can do

This fluid-bed roaster is said to have three advantages compared with more conventional roasting equipment, including lower investment cost, easier operation and higher SO_2 strength. In addition, it can operate on a wet slurry of about 80 percent solids, for example when used directly at a mineral concentrating plant.[29] For contact plant use the wet slurry is not disadvantageous—in fact, the water assists in temperature control in the roaster. However, a dry feed is needed for chamber plant use. When operated for maximum SO_2 recovery on pyrites, the roaster can produce a gas of 12-13 percent SO_2. At a small sacrifice of recovery, where extremely high SO_2 content is desired as in the sulphite pulp industry, it is possible to push gas strength up to 15-16 percent SO_2. This roaster, it is claimed, can be used without auxiliary fuel on pyrrhotites as low as 20 percent sulphur, even containing up to 20 percent water, and still produce 11-13

percent SO_2. The extremely close temperature control possible in a fluidized bed is said to minimize SO_3 formation and thus reduce the acid mist problem.

On a 46 percent sulphur-content pyrites, such roasters operate at 2.5-3 sq. ft. of reactor cross-sectional area per dry ton fed per day. Massive pyrites must be crushed to 10-14 mesh, but flotation concentrates can generally be used directly. The dust carry-over problem is said to be no more severe than with other roasting methods. In fact, the comparatively small volume of strong gas produced is claimed to reduce the size of gas-cleaning equipment that is needed.

Project at Noranda

One other pyrites operation that should be mentioned is the proposed plant for producing sulphur from pyrites which Noranda Mines, Ltd., in Quebec, is reported to have under consideration. Trade sources question whether this project will go through. However, Noranda is said to plan the expenditure of about $4 million for a plant which will produce about 50 tons per day of elemental sulphur by the distillation of pyrites. In this process, if oxygen is excluded, FeS_2 breaks down to yield FeS (pyrrhotite) plus elemental sulphur; under partial oxidizing conditions, the resulting reaction yields half its sulphur in elemental form, and half as SO_2. For economy, therefore, in recovering the other half of the contained sulphur, this process requires an acid plant or other use for SO_2. Interestingly enough, sulphur was produced by this process in China at least 100 years ago.

Sulphur in smelter gases . . .

Smelters in North America are potentially capable of providing tremendous tonnages of byproduct sulphur, probably approaching something like three-quarters of our total sulphur needs. Yet, in 1950, actual acid production of smelters was equivalent to only about 230,000 tons of sulphur, which was less than 4 percent of total equivalent sulphur production. Obviously, if economics permitted, smelter SO_2 could easily solve the sulphur problem.

. . . is far from markets,

There are two good reasons why smelters cannot be an immediate solution, and one good reason why economics is not always the determining factor. The most compelling reason against more smelter SO_2 recovery is distance. Much of the smelter production is far from existing markets for sulphur, liquid SO_2, and acid. Although sulphur at existing mine prices can be hauled long distances to market, the economic transportation limit for sulphuric acid is still considered to be about 200 miles. It is true that this distance has often been greatly exceeded under abnormal conditions, but a ton of 100 percent acid is equivalent roughly to only 615 lb. of sulphur. Again, liquid SO_2 has a strictly limited market under normal conditions, it must be transported under pressure, and only 50 percent of its weight is sulphur.

. . . and low in strength

The second reason against much expansion of smelter recovery is the fact that much of the SO_2 is given off at uneconomically low strengths, in the range of 1 to 3 percent. This is true particularly in the case of lead and copper ores. However, American Smelting & Refining Co. has found that by recirculation of gas in lead sulphide sintering, and by careful control and the maintenance of tight exhaust systems in copper converting, it is possible to secure strong enough gas for acid plant use. Although it is generally considered that 5.5-6 percent SO_2 is about a minimum for economical acid production, AS&R's new Tacoma, Wash., contact plant operates satisfactorily on 3.5 percent converter gas.[11]

Working in favor of more smelter gas recovery is the growing pressure by public authorities to reduce air pollution. The tremendous Consolidated Mining development at Trail, B. C., came from official pressure to reduce the smelter's SO_2 emission. Trail no longer operates its elemental sulphur-from-SO_2 plant, but its superphosphate and ammonium sulphate, nitrate and phosphate production bid fair to over-shadow its smelting activities, and sulphuric acid demand now exceeds the available SO_2 supply.

Asarco at Selby

One method of bringing weak smelter gases up to higher strength for use in SO_2 liquefaction or in acid manufacture is to absorb it preferentially in a solution which will give it up in more or less pure form on heating. This is generally similar to the process used for stripping H_2S from natural gas, except that different absorbents are used. AS&R, at its Selby smelter, developed such a process using anhydrous dimethylaniline. This is a modification of the earlier Guggenheim process used in Norway. At Selby the process recovers 20 tons of liquid SO_2 per day from a 5.5 percent gas. A duplicate unit is operating at Copperhill, Tenn. Fluor Corp. has been licensed to construct Asarco SO_2 concentration plants of this type.

Consolidated Mining, at Trail, produces 100 percent SO_2 from weak smelter gases by using 30 percent ammonia water as the absorbent. When the resulting ammonium bisulphite solution is heated and mixed with an excess of H_2SO_4, ammonium sulphate is formed and SO_2 vaporized. Success of the process depends on the fact that ammonium sulphate is one of the principal products of the plant. Except for this fact, it could not be used.

Many other SO_2 concentrating processes have been developed from time to time, but the only one now used in the U. S., aside from the Asarco process, is solution in water, a high-cost method still used in several plants which make liquid SO_2 from brimstone.

C.I.L. at Copper Cliff

A process which directly produces strong SO_2 without absorption is to be put into operation at Copper Cliff, Ont., by Canadian Industries, Ltd., in cooperation with International Nickel Co. This process involves flash smelting with tonnage oxygen, and yields about a 70 percent SO_2. After drying, the gas can be liquefied directly by compression and cooling. Off-gas then goes to a sulphuric acid plant. The contemplated capacity is said to be 45,000 tons of sulphur equivalent per year. It will go largely to the Canadian paper industry.

Although production of elemental sulphur from SO_2 has never made very great strides anywhere in the world—and none at all except on a pilot plant scale in the U. S.—it appears that conditions may now be approaching a point where processes of this sort can become attractive. Several such processes have been developed,

using reducing agents such as incandescent coke, CO, hydrocarbons such as natural gas, and H_2S. One of these is operating at present. In all the cost of carbon in the reducing agent is the economic determining factor.

The Trail process already mentioned, which is the only one ever operated commercially on this continent, used incandescent coke as the reducing agent. AS&R successfully operated a semi-commercial 5-ton plant for several years at Garfield, Utah, producing 99.9 percent sulphur and using methane in natural gas to reduce a relatively weak SO_2 ranging from 5.5 to 7.25 percent in concentration.[12] It has been claimed that the process would be competitive with 12-c. natural gas. Coke reduction processes were also operated for a time by both Imperial Chemical Industries in England, and by Boliden in Sweden. After its wartime shutdown the latter has been reported operating again.

And now low-grade sulphur

Production of sulphur from low-grade ores in Colorado, Nevada, Wyoming and California has been practiced on a small scale (5-8,000 tons per year) in recent years. Recently Chemical Construction Corp. announced a process[13] for the beneficiation of low-grade volcanic and surface supplies, which produces 99.5 percent sulphur from deposits containing as low as 25 percent S. This process involves grinding, heating in water suspension to a temperature above the sulphur melting point, screening, and subjecting the minus 20-mesh particles to froth flotation. The product is then melted and filtered. A plant being constructed in Colombia is expected to be in operation next summer, producing 30 tons per day. Two installations have been under consideration in Wyoming for a total of about 50 to 80 tons capacity per day. So far, neither has signed to use the Chemico process though one has gone ahead using a straight flotation concentration to produce about 88-90 percent sulphur, at a reported cost of $12 per ton.

Chemico has also been discussing the process with interested parties in Japan, Egypt, other Andean countries and elsewhere. Potential supplies in the Andes are large, perhaps 100 million tons of contained sulphur, but occur mainly at inaccessible points and high altitudes, presenting unfavorable working conditions.

Possibility that a large operation in Nevada will use low-grade ores directly for acid production via a Fluosolids roaster has been mentioned.

Two chances for calcium sulphate

Except for adverse economics, calcium sulphate could easily provide a large share of the world's sulphur and SO_2 radical, since supplies are widely distributed in extremely large quantities.[14] Plants in Germany and England adopted calcium sulphate as a means of making ammonium sulphate without acid some 30 years or more ago. In Germany gypsum was used and in England, anhydrite, which contains no water of crystallization and so requires less evaporation. Later plants were built by the I.G. at Wolfen, by Imperial Chemical Industries at Billingham, and by Kuhlmann at Miramas, France, for producing H_2SO_4 and portland cement from anhydrite (gypsum at Miramas). A combine of British chemical concerns is building a similar anhydrite-to-H_2SO_4 plant at Widnes, to make 50,000 tons sulphur equivalent per year (1954), and ICI is increasing the Billingham plant by 25,000 tons per year sulphur equivalent.

In addition to the plants in Germany and England which make ammonium sulphate from calcium sulphate, there are similar plants in France, Belgium and India. A second Indian plant is under construction. Phillips Chemical Co. has been reported to be considering such a plant in Texas, using byproduct gypsum from a proposed triple superphosphate plant.

Double decomposition looks better

Calcium sulphate appears to be most attractive in those countries which do not have sulphides or native sulphur in quantity. Of the two processes, the double-decomposition process for ammonium sulphate seems to have the better prospects for competing with conventional methods. Under favorable conditions Higson of Imperial Chemical Industries[14] estimates a lower production cost for this process than for the normally used saturator process employing H_2SO_4. Although simple on paper, the calcium sulphate process is actually very tricky, involving carbonation of the ammonia, reaction with the $CaSO_4$, handling of slurries and deposits, and disposal of much heat of reaction.

The case is still less attractive for the gypsum-cement-sulphuric acid process. Higson[14] estimates a 20 percent higher cost of acid—after credit for the cement clinker—than in making acid from sulphur, togther with a capital cost 3½ times as great. This acid cost estimate is slightly lower than for a pyrites burning plant. An estimate made in the U. S. on the basis of producing lime rather than cement as the joint product indicates that with gypsum at $2 per ton, acid cost would be about $25.70 per ton. This compares with $15 per ton of acid, using brimstone delivered at $30.

Endless sulphur in coal . . .

Sulphur in coal constitutes the only remaining large-scale source of this chemical. For very practical reasons it is virtually untapped in this country. However, coal may become an important source in the future. In 1947 the U. S. Bureau of Mines and the Geological Survey made a study of reserves, including sulphur in various forms. This survey listed reserves of sulphur in coal brasses obtainable at coal washing plants at 3,000 million long tons (compared with 75 million tons in pyrites recoverable in metal ores!). It estimated a like tonnage recoverable from gases produced in coking, and a similar tonnage from power plant gases.

. . . but not for today

Actually, present recovery of coal brasses is only a small operation in Indiana, and sometimes in Illinois. There is a small current production of a few thousand tons of elemental sulphur from Thylox purification units at coke and city gas plants. The old dry-box (iron oxide) process is still used in smaller gasification plants, and in some of the larger ones for final cleanup after wet processes such as the Thylox and vacuum carbonate, but in the U. S. there is no known recovery of sulphur from the spent oxide. Abroad, spent oxide has long been a relatively important sulphur raw material for acid plants. In England alone close to 100,000 tons of sulphur per year is recovered in this way. In 1946 this material provided sulphur equal to 30 percent of England's sulphur imports.

Studies both in England and in the U. S. have

indicated the unlikelihood that scrubbing of power plant stack gases can ever provide an appreciable source of sulphur. Two British power plants (one still operating) were equipped to wash stack gases for pollution control, but only pilot plant attempts were made at sulphur recovery which was found to be prohibitively expensive.

It is clear, therefore, that if we are ever forced to go to coal for sulphur recovery, the only practical attack will be through coal cleaning and through recovery at coking plants. Neither is impossible, but neither is attractive under present conditions.

Spent acid prospects

There are no reliable estimates of the amounts of spent sulphuric acid of one sort or another which, although recoverable, are not now being recovered. Spent acids occur in petroleum refining as heavy sludges and as black but still relatively strong and uncontaminated alkylation acid; in nitration processes as diluted but relatively uncontaminated spent acid; and in steel pickling and titanium dioxide manufacture as ferrous sulphate solutions containing considerable free acid.

At present there is a fairly sizable re-use of spent acids which, as already noted, is running about 2,000,000 tons a year. This includes acid re-used without concentration, concentrated acid, and acid fortified with SO_3 by recycling through a contact acid plant. There is recovery of sludges and alkylation acids at several plants by decomposing to SO_2 with heat alone, or by means of coke. The Chemico process operates at a temperature of about 2,200 deg. F., with or without auxiliary fuel depending on the hydrocarbon content of the acid feed. Monsanto's process, which can handle any flowable sludge, sprays the sludge on to cold coke which is subsequently heated to a maximum temperature of about 450 deg. F. In either case the resultant SO_2 is remade to acid in a normal sulphuric acid contact plant.

Re-use for refining, fertilizer

Spent acid is re-used in petroleum refining operations and is used to some extent for the acidulation of phosphate rock. In some cases, rock acidulators have preferred the spent acid to new acid, claiming that the dark superphosphate so formed had better physical properties.

Lacking definite information, it is still a safe guess that more recoverable acid is being wasted than is being recovered. Petroleum refiners often feel that such recovery is both a nuisance and a dubious source of profit. This viewpoint is contradicted by the experience of Consolidated Chemical Industries which has found sludge acid recovery operations profitable, witness the company's versatile new 400 ton-a-day acid plant now building at Baton Rouge, specifically for sludge recovery.

One suggested recovery process that may turn out to be useful to refiners who have an H_2S supply is to break down sludge acids to SO_2 by heat, then combine the SO_2 and H_2S in a Claus kiln process to yield elemental sulphur.

What about pickle liquor?

So far as waste ferrous sulphate solutions is concerned, there is nothing technically wrong with their recovery as acid. Chemico has a new process said to overcome the disadvantages of the earlier process of $FeSO_4$ recovery installed and later discontinued at two titanium pigment plants. However, it seems that at present the idea is economically unattractive owing to heavy water-evaporation needs. Apparently it will take a further pinch in acid supplies, or further restrictions against dumping, to make the process an important pickle-liquor recovery factor.

Another recovery process now operated commercially in England, but rather unlikely in the U. S., is the separation and reconcentration of sulphuric acid from the sodium sulphate contained in waste viscose rayon spinning bath. Courtaulds' purpose in using this process at Wolverhampton is primarily acid, not sodium sulphate, recovery. The sulphate has been recovered from spinning bath solutions in this country.

Methods for acid economy

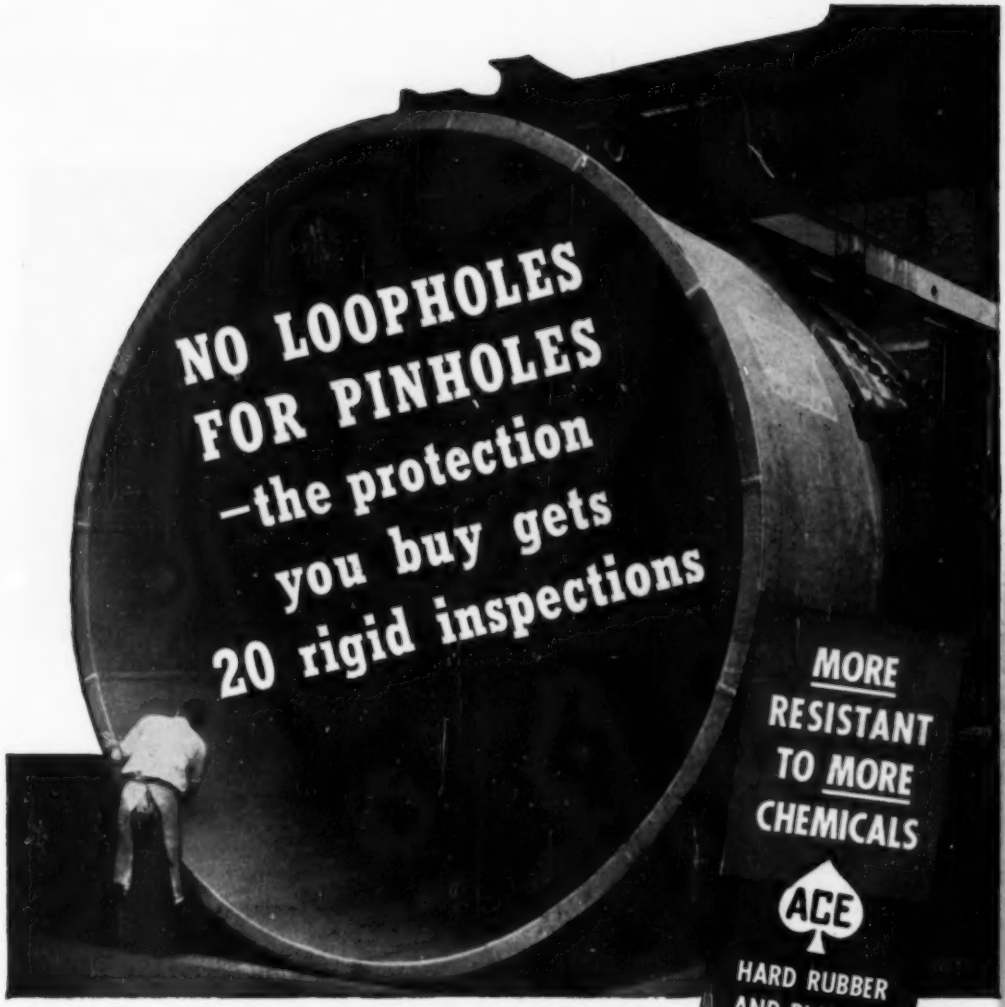
Electrolytic pickling in the steel industry is one method of acid economy that is mentioned, while some of the newer wood-pulping processes, such as the ammonium bisulphite process, are said to be potential sulphur savers. TVA is considerably interested in superphosphate manufacturing processes which would substitute nitric or phosphoric acids, all or in part, for H_2SO_4 in the acidulation of phosphate rock. Electric-furnace phosphoric acid, of course, is being used in the manufacture of triple superphosphate. Against this, however, is AEC's new program of securing uranium from phosphoric acid manufacture, and this requires that the acid be made with sulphuric, by the wet process. It may indeed provide the urge for the use of more, rather than less, sulphuric acid in triple super manufacture.

Fertilizer without sulphuric

European fertilizer plants have used nitric acid for many years in phosphate rock acidulation. TVA has explored these processes quite thoroughly,[15] as has the U. S. Department of Agriculture.[16] The main problem is hygroscopicity of the product, due to the presence of calcium nitrate. Several methods have been developed for overcoming this difficulty, by using either nitric acid alone, or part phosphoric or sulphuric, in any case followed by ammoniation. An opportunity for sulphur economy in the industry which uses by far the largest part of our sulphuric acid, would thus seem to be a distinct possibility.

REFERENCES

1. Carrington, J. C., paper before Ind. Minerals Div., A.I.M.E., Morgantown, W. Va., Sept. 14, 1951.
2. Arden, Frederic, Asst. Dir., Chem. and Rubber Prods Bureau, NPA, in paper before CMRA, Wilmington, Del., Dec. 13, 1951.
3. Tait, Thomas, ACS meeting, New York, Sept. 1951.
4. Nelson, W. L., *Oil & Gas J.*, Nov. 1, 1951.
5. Sawyer, Hader, Herndon and Morningstar, *Ind. Eng. Chem.*, **42**, 1938, (1950).
6. Lee, J. A., *Chem. Met. Eng.*, **49**, 80 June 1942.
7. *Heat Eng.*, Mar. 1951.
8. Reed, R. M., Updegraff, N. C., and Parker, J. L., *Oil & Gas J.*, p. 48, Jan. 4, 1951.
9. Frazier, H. D., and Kohl, A. L., *Ind. Eng. Chem.*, **42**, 2288, (1950).
10. Counselman, T. B., *Eng. Min. J.*, **151**, 84, Mar. 1950.
11. Fleming, E. P., Ind. Hyg. Foundation., Trans. Bull. No. 18, Nov. 15, 1950.
12. Fleming, E. P., and Fitt, T. C., *Ind. Eng. Chem.*, **42**, 2249 (1950).
13. *Chem. Eng.*, **88**, 128, Mar. 1950.
14. Higson, G. I., *Chem. & Ind.*, p. 750, Sept. 8, 1950; also, *Chem. & Eng. News*, **29**, 4469, Oct. 22, 1951.
15. Hignett, T. P., *Chem. Eng.*, **58**, 166, May 1951.
16. Clark, K. G., and Hardesty, J. O., U.S.D.A. Special Report 41, 1951.



THERE'S no short-cut to *sure* corrosion protection. Every ACE Rubber lined tank, valve, pump or piping system gets no less than 20 major inspections, developed through 100 years of experience with this finest of corrosion resistant materials.

For instance, every inch of our standard hard rubber lining is given a 35,000 volt brush test—enough voltage to track down any slight, unsuspected weakness up to eight inches away. In another test, a piece from the same batch of rubber, bonded and vulcanized at the same time as the lining, is sent to the ACE laboratory for complete breakdown tests. To be sure of the protection you buy, be sure to specify ACE.

In all types of chemical equipment, ACE hard rubber linings and coverings are available to resist all alkalies, metallic salts, inorganic acids, hydrochloric acid any strength, sulphuric acid to 50° Bé, nitric acid to 16° Bé, phosphoric acid to 75%, and countless other corrosives. Other ACE plastics extend this range still further. *Ask for catalogs.*

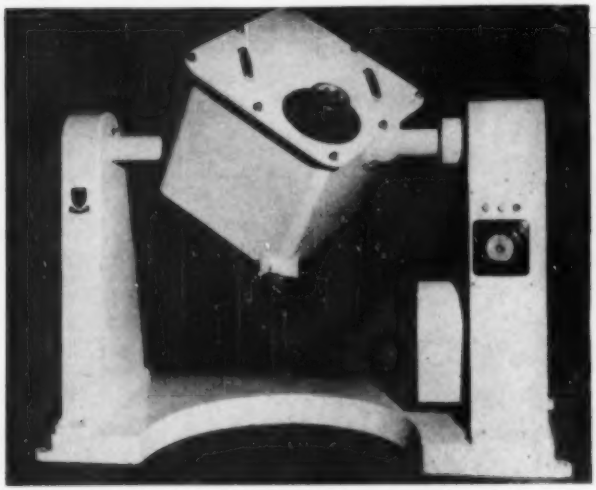
100th ANNIVERSARY

AMERICAN HARD RUBBER COMPANY

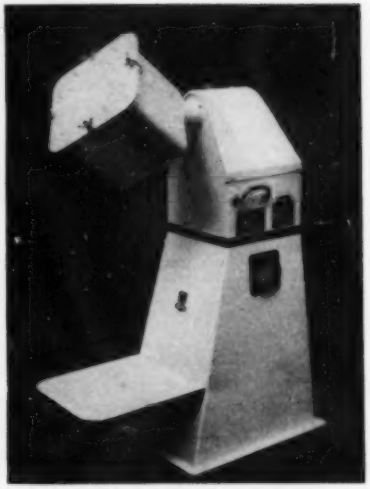
ACE

93 WORTH ST. • NEW YORK 13, N. Y.

NEW PROCESSING EQUIPMENT



PRODUCTION MODELS can be furnished in packaged units, as shown here, or minus the base for mounting on your own foundations.



LABORATORY MODEL operates on principles identical with production machines.

Rotating Cube Gives Uniform Blending

Figure-eight mixing action eliminates dead spots and uniformly distributes components.

(178A) Maybe you saw these new dry-solids blenders on exhibit at the recent Chemical Show in New York. Chances are, however, you did not realize that they had been flown over from England just in time for the opening of the Show. Arrangements for marketing them in the U. S. had just been concluded the week before.

Developed recently by Foster, Yates & Thom, Ltd., the new machine consists essentially of a cubic drum mounted diagonally at a compound angle on trunnions and rotating at a speed of approximately 10 rpm. It has been appropriately dubbed the Rotocube by the new domestic distributor.

The path of a solid particle inside the drum resembles a figure eight, producing an interweaving action which effects uniform distribution of the components of the batch, even when the ingredients vary widely with respect to specific gravity, particle size and proportions. Internal impellers can be used when blending ingredients which do not flow readily or have a tendency to clog. To the interweaving action, then, is added a gentle overturning motion.

A very short mixing time is claimed for the Rotocube. Under laboratory conditions six ingredients varying widely in character and proportions were mixed for 5 min. in a standard machine. An independent analysis showed the distribution of each ingredient to be "99.79 percent perfect" throughout the mix.

The action is said to be so gentle that attrition or pulverizing is minimized. Another attractive feature is the ease with which you can clean the mixing container. Cleaning is facilitated by the complete elimination of cavities where solids might lodge and by the heavy radiusing of all inside corners.

Five industrial sizes are available. The smallest has a drum 18 in. on a side with a capacity of 1.5 cu. ft. The largest drum is 48 in. on a side with a capacity of 25 cu. ft. In addition there are two laboratory models with drums of 9 in. and 12 in.

Industrial models can be furnished on a stand with all electrical equipment and drive built in and completely enclosed. This arrangement makes the unit portable, requiring only connection to a source of power. For permanent installations, the machine is usually mounted on the purchaser's own foundation columns.

Special attention has been paid to mechanical design, particularly to the sealing of the various bearings. Protection is provided against seepage of oil into the mix and against fine particles of the mix getting into the bearings.

Drums and impellers can be made from a wide variety of materials, including stainless steel.—*Chase Equipment Corp.*

Molding Press Works at High Speed

(178B) A new straight-ram hydraulic compression molding press is designed to do deep draw work at high speed. It can be used for molding such parts as radio cabinets and other relatively deep parts, at no sacrifice in flexibility for shallow work. A new type of 3-speed closing mechan-

ism offers the advantages of conventional design plus a saving in the overall time cycle.

Known as Model 726, the new press is available in 100 and 200-ton sizes. —*F. J. Stokes Machine Co.*

Centrifugal Contactor Will Handle Solids

(179A) The Podbielniak centrifugal contactor has been redesigned to permit handling of liquid-liquid extraction jobs where either of the liquids contains suspended solids. The necessity for preliminary filtration is thus obviated. In addition, the recovery of product may also be increased.

Ability to handle solids depends upon maintaining flow rates which are sufficient to keep the solids moving through the machine and discharging continuously. The manufacturer claims to have developed a design which provides the required action.—*Podbielniak, Inc.*

Extension Collar Protects Glass Linings

(179B) A new glass-lined extension collar which fastens to the main manhole flange of glass-lined kettles will lengthen the life of the kettles by absorbing the wear that the kettle flange usually takes. If the extension collar is damaged in any way, it can be quickly replaced by a spare collar. The cost of repairing or replacing the collar is small compared to that of repairing the entire kettle.

Standard design for the new collar is 12 by 16 in., with heavy forged flanges.—*Pfaudler Co.*

Equipment Cost Indexes

(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

Industry	Sept. 1950	June 1951	Sept. 1951
Average of all	171.5	180.9	179.1
Process Industries			
Cement mfg.	163.4	173.1	171.5
Chemical	171.4	181.1	179.5
Clay products	158.4	168.1	166.5
Glass mfg.	161.5	171.2	169.6
Paint mfg.	164.7	174.4	172.8
Paper mfg.	165.0	174.7	173.1
Petroleum ind.	167.8	177.5	175.9
Rubber ind.	170.2	179.9	178.3
Process ind. avg.	168.9	178.5	176.9
Related Industries			
Elec. power equip.	173.0	182.7	181.1
Mining, milling	172.1	181.8	180.2
Refrigerating	190.8	200.5	198.6
Steam power	160.1	170.2	168.7

Compiled quarterly for March, June, September, and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1951, p. 158.

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

Processing Equipment		Page
Dry Solids Blender	Rotating cube promotes uniform mixing	178A
Molding Press	For deep draw work at high speed	178B
Centrifugal Contactor	Redesigned to permit handling of solids	179A
Extension Collar	Can be easily repaired or replaced	179B
Dehydrator	Removes water from low viscosity liquids	180A
Water Treating Process	Catalytic cells remove scale and rust	180B
Intensive Mixers	Anti-friction bearings reduce power needs	180C
Compression Evaporator	Driven by a diesel engine	180D
Continuous Kneader	Worm blade rotates in a trough	180E
Electrical and Mechanical Equipment		
Steam Cleaning Unit	Works from plant steam supply	182A
Steam Jet Cleaners	High pressures get high velocities	182B
Magnetic Starters	Dual voltage coils simplify changes	182C
Adjustable Speed Motor	Movable brushes regulate the speed	182D
Insulation Tester	For high-voltage d.c. tests	182E
Insulation Tester	Electronic circuit for stepless adjustment	182F
Position Switch	Maintains open or closed position	182G
Instrument Drive	Provides 20 oz.-in. torque	182H
Universal Vise	For objects with irregular shapes	182I
Plastic O-Rings	Made of Teflon and Kel-F	182J
Wet Blast Machine	Vertical pump recirculates slurry	182K
Voltage Regulator	Accurate to 0.01 percent	182L
Single-Stage Turbine	Develops 50 to 200 hp	182M
Gas Turbine	Drives a centrifugal pipeline compressor	182N
Safety Equipment		
Emergency Showers	Give fast and thorough rinse	184A
Safety Shoes	Special materials resist chemicals	184B
Fire Detector	Action is independent of rate of rise	184C
Packaging and Handling Equipment		
Bag Closing Machine	Sealing is completely automatic	186A
Classifying Scale	Checks weights on the run	186B
Filling Scale	Fills bags and drums up to 200 lb	186C
Lined Paper Bags	For packaging toxic chemicals	186D
Conveyor Curve	Turns 90-deg. corners	186E
Stacker Truck	Requires minimum aisle space	186F
Steel Chutes	Formed in one piece	186G
Electric Truck	For skid platforms and skidded cases	186H
Package Printer	Automatically produces 4-line imprints	186I
Universal Clamp	Attaches to fork truck	186J
Fluids Handling Equipment		
Reagent Pump	Delivery can be instantly changed	188A
Small Volume Pump	Provides pulse-free continuous flow	188B
Tank Bushing	With suction and return connections	188C
Roof Ventilator	Open only when fan is operating	188D
Steel Blowers	In sizes up to 200 hp	188E
Sump Pump	Hermetically sealed motor is submersible	188F
Suction Line Strainer	Fits through 2-in. opening	188G
Centrifugal Pump	Stainless steel in 9 sizes	188H
Steel Tubing	Can substitute for other materials	188I
Steel Valves	For pressures up to 800 psi	188J
Materials of Construction		
Tenite Pipe	Good corrosion resistance, low friction	190A
Plastic Liner	Vinyl resin protects concrete sewer	190B
Chrome Carbide	Resists corrosion, abrasion, heat	190C
Porous Cobalt Alloy	Highly resistant to HCl, chlorine	191A
Welding Guns	For joining polyethylene and PVC	191B
Asphaltic Coating	Available in sprayable form	191C
Plastic-Covered Bolts	Vinyl sheath offers corrosion resistance	191D
Refractory Coating	Reduces wear, lengthens life	191E
Lead-Clad Copper	Metals are drawn simultaneously	191F
Instruments and Controls		
Magnetic Flowmeter	Based on Faraday's classic law	192A
Control Unit	No friction or lost motion	192B
Surface Thermometer	Reflective coating guards against radiation	192C
Mass Spectrometer	Analyzes mixtures, determines isotopes	192D
Speed Indicator	Dial has extra scale divisions	192E
Temperature Regulator	Dial adjustment for visual control	192F
Electric Stopwatch	Uses special synchronous motor	192G
Instrument Winder	Better than a key	192H
Flow Colorimeter	Makes continuous absorption measurements	192I
Scanning System	Automatically scans in sequence	192J
pH Indicator	Unaffected by voltage fluctuations	194A
Valve Positioner	For long strokes and large forces	194B
Load Cell	Converts mechanical force to electric signal	194C
Pressure Transmitter	For pressures less than atmosphere	194D
Heating and Cooling Equipment		
Forced Draft Burner	Factory wired and assembled	194E
Heating Mantle	Fits 55-gal. drums	194F
Compressed Fuel Torch	Requires no pumping or priming	195A
Condensate Return Unit	Selection of 44 sizes	195B
Electric Oven	Protects welding rods against moisture	196A
Electric Oven	With eight sliding drawers	196B

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers

Dehydrator For Low Viscosity Liquids

(180A) A new unit dehydrates low viscosity liquids by passing the liquid through elements which are a combination of wound cellulose cylinders, specially treated coalescing media, perforated metal and glass cloth. Where there is a possibility of having large volumes of water in the liquid, you can get an automatic ejector.

Units are available in capacities of 350 and 600 gpm.—*Bowser, Inc.*

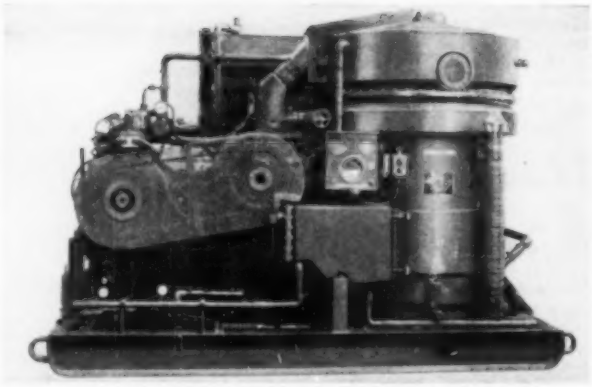
Water Treating Process Eliminates Scale and Rust

(180B) The Sola process for treating water is said to precipitate the scale-forming impurities in a state of permanent dispersion so that they will not deposit in the form of scale. According to claims, the process will also remove scale and rust already in the system through which the water passes.

The process was invented by a French physicist named Andre Barbier. It is reported that there are more than 12,000 successful installations, most of them in Europe and North Africa.

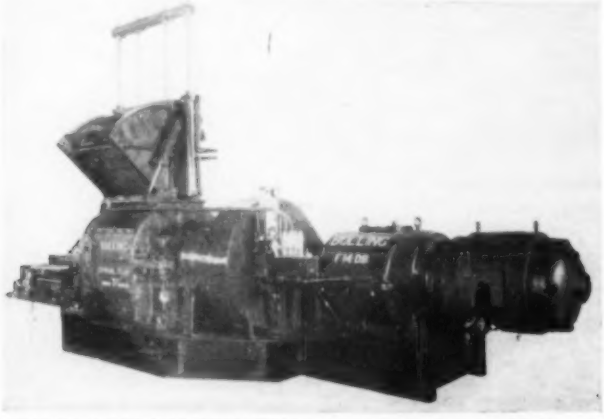
Just how the process works is not clearly revealed by the vendor. The physical setup consists simply of a cylindrical tank provided with an interior chamber which encloses some "catalytic cells." These cells are supposed to produce a variable magnetic field in the water passing through the tank. This field "has the power of converting unstable para-hydrogen to ortho-hydrogen." The ortho-hydrogen then acts on oxygen "so that it becomes a very active element," which is possible because of oxygen's very strong paramagnetic properties. The ortho-hydrogen and the activated oxygen are said to cause the desired action on the "paramagnetic impurities" in the water.

The process is available on a lease basis. The vendor provides the treatment unit and maintains it throughout the contract period, including semi-annual replacement of the cells. —*Sola Catalytic Co.*



THERMOCOMPRESSION EVAPORATOR IS DIESEL POWERED

(180D) **This unit will produce 335 gal. per hr. of distilled water or perform other distillation or concentration jobs. Skid mounted, it is powered with a diesel engine.—Mechanical Equipment Co.**



INTENSIVE MIXERS OPERATE ON ANTI-FRICTION BEARINGS

(180C) **A fourth size is being added to this established line of Banbury type intensive mixers. Adaptable to plastics or rubber without change, these machines operate entirely on anti-friction bearings, reducing power consumption and preventing end motion in the rotors. Split frames permit accessibility to working parts.—Stewart Bolling & Co.**

Continuous Kneader Uses New Principle

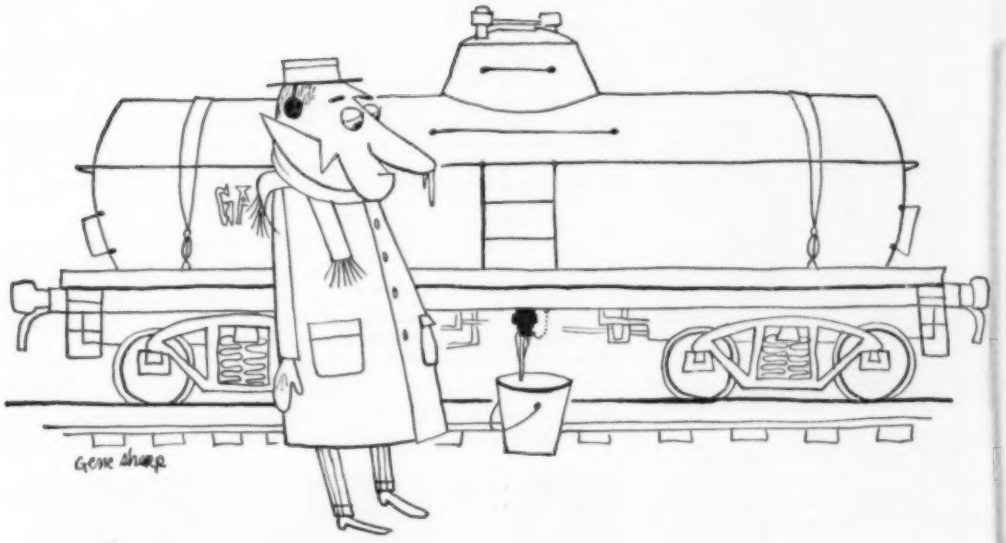
(180E) The Ko-Kneader, a new machine for continuous mixing and kneading, uses what is claimed to be a completely new simplified working principle. The machine consists essentially of a worm blade rotating in a trough. This blade has gaps at regular intervals which correspond with teeth in the trough. As the worm rotates, it also moves back and forth horizontally so that the gaps meet and pass the teeth.

Material fed into the trough is forced forward by the worm blade until it comes to a kneading tooth. As the blade passes the tooth, it forces part of the material with it and leaves the rest behind. This process is repeated along the entire length of the trough.

Three models of the Ko-Kneader are available for light, medium and heavy duties. They may be built in steel or stainless steel. Parts subject to abrasive action can be made of wear-resistant materials; these parts are designed for easy replacement.

Machines can be designed for a large variety of processing operations by changing the number and shape of the kneading teeth. Production rate and residence time can be regulated simply by adjusting the counter pressure and axial stroke.—*Baker Perkins Inc.*

THE CARE AND NURSING OF TANK CARS



If there's frozen liquid
in the outlet valve:—
unload through the dome.

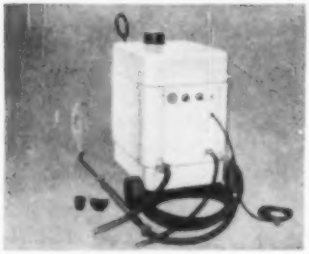
Another way to get more from your GATX tank cars

GATX GENERAL AMERICAN

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street · Chicago 90, Illinois

District Offices: Buffalo • Cleveland • Dallas • Houston • Los Angeles • New Orleans
New York • Pittsburgh • St. Louis • San Francisco • Seattle • Tulsa • Washington
Export Dept.: 10 East 49th Street, New York 17, New York

So many people have requested reprints of these cartoon advertisements that we are making them available to you for use in your shops. Just write us.



Steam Cleaning Unit Works From Plant Supply

(182A) The new Model F-15 steam cleaner works from any plant steam supply of 60 to 150 psi. It mixes steam with positive pumped proportions of water and cleaning solution. Output is 45 to 90 gal. per hr.—*Homestead Valve Mfg. Co.*

Steam Jet Cleaners With Higher Velocities

(182B) The new Model JC-25 Speedylectric steam jet cleaner is built to operate at pressures up to 200 psi. in order to get higher jet velocities than were previously available. The 20-kw. boiler operates at 220, 440 or 550 v.

Another new model, the JC-75 (not illustrated), exceeds in capacity any previously available model. It requires a power supply of at least 60 kw. With a water supply of 250 to 300 gal. per hr., you can also use this machine to get a high-velocity cold water rinse.—*Livingstone Engineering Co.*

Magnetic Starters Have Dual Voltage Coils

(182C) A new line of magnetic starters and contactors features dual voltage coils. This eliminates the need for stocking extra coils for changing the voltage and allows you to match coils to dual voltage motors. These starters also have a one-piece molded plastic terminal board, said to represent a big advance in plastics technology.

Another interesting feature is the availability of a Size 1½. This size takes care of many jobs which would ordinarily require the larger Size 2.—*Furnas Electric Co.*

Adjustable Speed Motor Uses Movable Brushes

(182D) The Schrage adjustable speed induction motor developed by Ateliers de Constructions Electriques de Charleroi is now being introduced into this country. Speed is regulated by altering the relative positions of the brushes.

Although the standard type permits a speed variation over a range where the top speed is 3 times the bottom speed, other types offer ratios of 2, 4, 5 and 6. Another type provides for speed variation down to zero. All motors have a synchronous speed of 1,200 rpm. and a top speed of 1,800 or 2,400 rpm. Horsepower ratings vary from 1½ to 15.—*Belgiam Electric Sales Corp.*

Electrical & Mechanical Briefs

Insulation Tester—For high-voltage d.c. insulation tests. Made in ranges up to 75 kv. John Hewson Co. *(182E)*

Insulation Tester—Provides d.c. potentials up to 10,000 v. Electronic circuit permits stepless adjustment. Herman H. Sticht Co. *(182F)*

Maintained Position Switch—First press transfers the contacts, second press restores them. Contacts are rated at 20 amp., 125 v. a.c., non-inductive. General Control Co. *(182G)*

Instrument Drive—Provides 20 oz.-in. torque with output shaft rotation of 13 speeds. For 115 v. a.c. Gorrell & Gorrell. *(182H)*

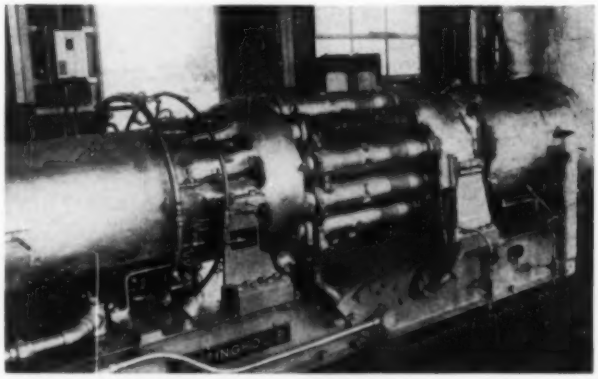
Universal Vise—Clamps round, tapered or irregular objects. DeWilde-Jones, Inc. *(182I)*

Plastic O-Rings—Teflon and Kel-F O-rings and gaskets, made to conform with Army-Navy specifications. Plastic Coating, Inc. *(182J)*

Wet Blast Machine—Used where dry blasting is too severe. Features a vertical pump for slurry recirculation. American Wheelabrator & Equipment Corp. *(182K)*

Voltage Regulator—Accurate to 0.01 percent. Output adjustable from 110 to 120 v. a.c. Uses only four vacuum tubes and no relays. Sorensen & Co. *(182L)*

Single-Stage Turbine — Combines many new improvements. Develops 50 to 200 hp., depending upon speed and steam conditions. Murray Iron Works Co. *(182M)*



SMALL GAS TURBINE PROVES SUCCESSFUL

(182N) **Here's proof of the point made in our story last month (p. 182) that small gas turbines can compete with other prime movers. This 1,850-hp. unit, installed in 1946 on an experimental basis, has been purchased by the Mississippi River Fuel Corp. for driving a centrifugal pipeline compressor.—Westinghouse Electric Corp.**

CORROSION CHECKED IN CAUSTIC LIQUOR LINES ...AND ELSEWHERE

...WITH 18-8 MO TRIMMED CRANE ALLOY CAST IRON GATES

These Crane low nickel alloy cast iron valves give excellent results in many services where conventional "all-iron" and "brass trimmed" valves fail because of corrosive conditions. Today, they are also finding wider application on mildly corrosive services, or services where some corrosion is permissible, as substitutes for the more expensive, hard-to-get, all 18-8 stainless steel valves. In design and in materials, Crane No. 14477 valves have many value-adding features like these:

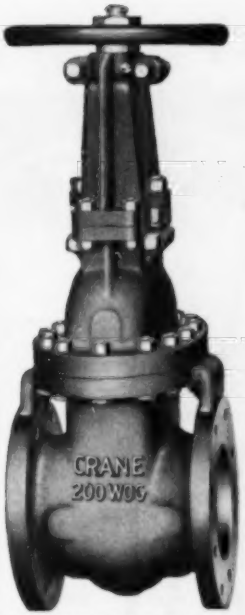
STEM THREADS ARE OUTSIDE VALVE BODY—not exposed to erosive and corrosive effects of line fluids; simplifies thread lubrication.

ACCURATE, TIGHT SEATING—extra long disc guides keep disc travel true; minimize drag on seating surfaces. Screwed-in shoulder type body seat rings do not loosen in service.

PROVED CORROSION-RESISTANT MATERIALS—Body seat rings, stem, and disc faces are 18-8 Mo; packing gland is nickel-plated steel; body, bonnet, and disc are nickel low alloy cast iron.

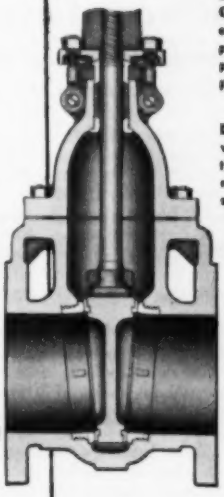
EXTRA RESISTANCE TO LINE STRAINS assured by tie ribs between end and bonnet flanges. Husky body-bonnet flanges use more bolts of smaller diameter to equalize pressure on gasket for maximum safety and tightness.

FOR COMPLETE INFORMATION about these readily available, widely applicable corrosion-resistant valves, see your Crane No. 49 Catalog, p. 375—or ask your Crane Representative for service recommendations and specification data.



No. 14477 Gate 18-8 Mo Trimmed. Working Pressure: 200 pounds cold water, oil, or gas. Sizes: 2 to 12 inch. Flanged Ends.

Easy to operate... Easy to service



BOLTED PACKING GLAND with swinging eye bolts equalizes pressure on packing; permits easy pull-up; prevents stem binding.

DEEP STUFFING BOX with two-piece bolt-type gland and flange maintains tight stem seal.

T-HEAD DISC-STEM connection prevents side strain on stem; gives flexibility for smooth operation.

STRAIGHT THROUGH PORTS assure unrestricted flow; minimize turbulence and corrosive action.

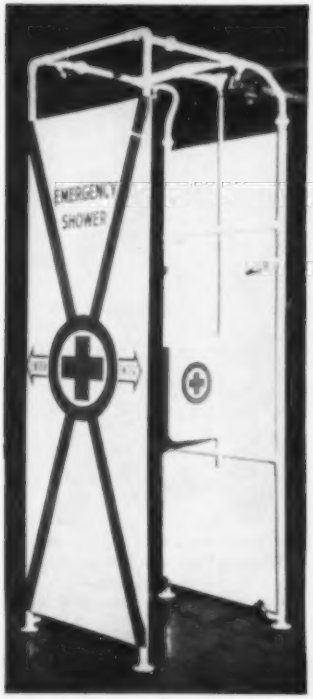
Cross-section No. 14477

EQUIPMENT FOR EVERY PIPING SYSTEM

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING



SWING GATE requires only slight body pressure to activate the shower.

COMPLETE COVERAGE is provided from all directions by 12 sprays.

New Showers Give Fast Rinse

Strategically located sprays assure thorough, rapid cleansing in case of emergency.

(184A) A new series of emergency showers is designed to provide a degree of cleansing action consistent with the hazards involved. The fastest one, Model 5010, has been shown by actual test with a high-viscosity water-soluble material to remove this material completely from all parts of the body, without rubbing, in only 15 seconds.

This high speed is accomplished by locating the sprays so that all parts of the body are reached simultaneously. In addition to the orthodox overhead sprays there are four lower sprays directed upward to reach under smocks and coats. Water from these sprays reaches between the legs and under the buttocks. Four more streams directed from holes at the base of the shower reach the feet. In addition two special sprays play on the eyes and face without interfering with sight or breathing.

This model is built so that you can enter it from either of two sides and instantly activate it by the slightest pressure on a gate which swings in either direction. The valve remains open after being activated until manually closed, leaving your hands free.

Somewhat less efficient in the matter of time required for complete wetting (28 sec. under similar conditions) is the Model 5026. This unit provides fast wetting and washing of the major portions of the body but requires you to turn around to assure full body coverage. It has the overhead sprays and eye and face sprays of Model 5010, but only two each of the lower sets of sprays. It has an advantage, however, in that you can enter it from three sides.

Model 5040 provides protection against minimum hazards. In this unit all sprays are directed downward. This shower is accessible from all directions and is quickly placed in operation by slight pressure downward on a telescoping rod whose base is anchored to the floor.

All three types use brass for all functional parts. They can be furnished in any metal and finish desired.—*Logan Emergency Showers, Inc.*

Safety Shoes Resist Chemical Attack

(184B) A new line of safety shoes has been developed especially for the chemical industry. They are made of extra soft upper leather, treated for chemical resistance. Dacron polyester fiber is used for lining, stitching and laces. Soles are of neoprene and heels of Neo-cord. Both high and low styles are available.—*Record Industrial Co.*

Fire Detector Is Rate Compensated

(184C) A new type of fire detector reacts accurately and positively to the surrounding air temperature without having to be heated throughout before it gives an alarm. Its action is thus independent of the rate of temperature rise.

The outer shell, exposed directly to the surrounding air temperature, is the activating element. Two fine silver contacts are mounted on, but electrically insulated from, two curved struts having a low expansion coefficient. This assembly is mounted under compression in a tubular stainless steel shell having a high coefficient of expansion. Temperature changes cause the shell to expand or contract. As it does so, it exerts a magnified motion to the contacts.

Units are available in standard vertical models, also in horizontal models for use where appearance is a factor (illustrated); for ordinary and hazardous locations; and for flush or surface mounting.—*Fenwal Inc.*

ANNOUNCING *Lightnin*® *Mixers*

NEW CATALOG

Tells how you get *guaranteed* fluid agitation results with the outstanding new *LIGHTNIN* "Series E" Mixers for open tanks and closed pressure vessels.

Shows how interchangeable speeds can save you money if your process changes. *LIGHTNIN* "Series E" Mixers offer up to 16 standard AGMA speeds from one basic drive.

Shows how standard *LIGHTNIN* Mixers can give you the versatility of custom-design units costing considerably more.

Describes how mixing impellers are selected for specific jobs.

Tells how Mixco's engineering experience and unique research facilities can give you accurate prediction of process results.

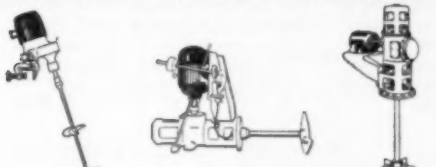
Contains a wealth of fluid agitation facts, unavailable from any other source.

Send for the New *LIGHTNIN* Mixers Catalog B-102 today. Just mail the coupon below.

MIXCO

fluid agitation specialists

EVERY *LIGHTNIN* MIXER IS GUARANTEED TO DO THE JOB *RIGHT*



PORTABLE
⅛ to 3 HP

SIDE ENTERING
1 to 25 HP

TOP ENTERING
1 to 500 HP

MIXING EQUIPMENT Co., Inc.

128 Mt. Read Blvd., Rochester 11, N. Y.

In Canada: William & J. G. Greey, Ltd., Toronto

Please send me the new B-102 Catalog describing *LIGHTNIN* "Series E" Mixers. Also, please send the literature checked:

- ☐ B-76 Side Entering Mixers
- ☐ B-78 Top Entering Mixers (Propeller Type)
- ☐ DH-50 Laboratory Mixers
- ☐ B-100 Condensed Catalog showing complete line
- ☐ B-75 Portable Mixers (Electric and Air Driven)

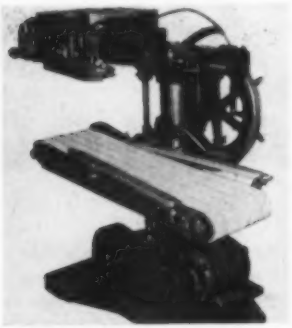
Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____



Bag Closing Machine Is Completely Automatic

(186A) The Minneapolis bag closing machine, now in quantity production, is described as the only fully automatic machine of its type. Capable of closing up to 2,000 paper bags per hr. weighing from 2 to 100 lb. when filled, it is said to require no attendant—sealing is completely automatic.

The machine closes all sizes of open-mouth paper bags by a unique arrangement of chain drives which compress the top of the bag and then seal it shut by a specially designed wire ring. The sealing wire is fed from a large spool which needs replacement only once a day even at maximum machine capacity. The sealed bags are uniformly neat, easy to handle and convenient to store. Even powdery material cannot seep through the ring-sealed top, it is claimed.

The unit occupies a floor space of 32 by 45 in. and weighs 870 lb. It is driven by a ½ or 1-hp. motor.—*Hamer Machine Co.*

Classifying Scale Weighs on the Run

(186B) A new high speed, fully automatic scale will check-weigh prefilled containers for under-weights, over-weights or both. It can also be used to classify finished products into various weight groups or zones.

This machine uses what is said to be an entirely new principle of weighing that gives improved accuracy and sensitivity, greater speed, simplicity and long life. The system is dynamic rather than static—weighing is done on the run without having to take time out to allow an indicating mechanism to come to rest.

The scale will handle objects weighing from 4 oz. to 10 lb. Maximum length of object is 12 in., maximum width, 6 in. Height is unlimited as long as the object is stable as it is conveyed along the belt.

Speed of operation varies with the length of the object. Objects less than 3 in. long are weighed and sorted at a rate of 100 per min.

Here is how it works: Articles to be weighed come from the production line, single file, and enter via an approach belt. At the end of this belt is an indexing device which feeds the objects one at a time onto the continuous running scale belt. After they leave the scale belt, they go to a distributing belt which electrically diverts them into the proper slot for each particular weight group.—*Toledo Scale Co.*

Automatic Filling Scale Is Accurate to 1/10 Lb.

(186C) Model 400 filling scale may be used for filling bags and drums to any weight up to 200 lb. Because of the complete absence of knife-edge pivots, crystals or bearings, this new scale is accurate to within 0.1 lb., it is claimed. It will handle materials within the bulk density range of 15 to 100 lb. per cu. ft.

The scale works automatically; all you do is slip the bag in place, then pull down and immediately release a handle. Three lights at eye level indicate stages of the filling process. The bottom amber light is on while a bag is being filled. The center light, which is white, indicates that the bag has been filled to the proper weight. A red light at the top shows when the bag is overweight. The scale will not automatically release overweight bags.

All parts of the feeder which come in contact with the material are made of stainless steel. The feeder gate is self-cleaning of materials which have a tendency to cake and shuts off completely to protect hygroscopic materials and to stop flooding.—*Thayer Scale and Engineering Corp.*

Lined Paper Bags For Toxic Chemicals

(186D) A specially constructed paper bag has been developed to package toxic chemicals, such as Parathion insecticide. Of duplex construction, the bag has an inner liner of Unithene, a polyethylene-coated kraft paper. This liner offers adequate resistance to the contents as well as to outside moisture penetration. The smooth interior surface also facilitates complete emptying of the package.—*Union Bag & Paper Corp.*

Packaging & Handling Briefs

Conveyor Curve—Turns 90-deg. corners. Power driven, uses tapered rollers and V-belt drive. Alvey-Ferguson Co. *(186E)*

Stacker Truck—For handling loads in minimum aisle space. Capacity of 1,000 lb. Lewis-Shepard Products, Inc. *(186F)*

Steel Chutes—Standard models in lengths of 6, 8, 10 and 12 ft. and widths from 6 to 36 in. in 6-in. increments. Formed in one piece from heavy gage steel with sides 6 in. high. Sage Equipment Co. *(186G)*

Electric Truck—Handles skid platforms and skidded cases up to 4,000 lb. Standard 4-in. lift. Raymond Corp. *(186H)*

Package Printer—Automatically produces spot-registered imprints of weights, sizes, etc., on small cartons, cans, canisters and bottles. Legends can contain up to four lines of copy. Adolph Gottscho, Inc. *(186I)*

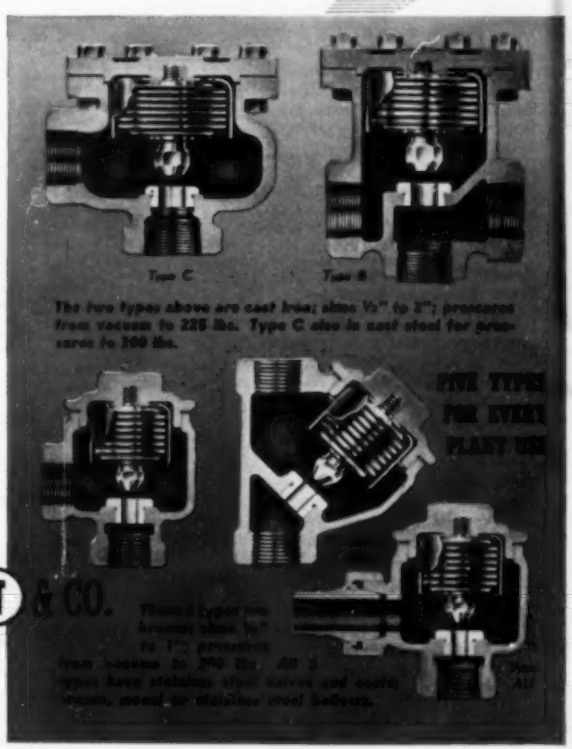
Universal Clamp—Fork truck attachment; can handle boxes, cases, pallets, skid platforms, rolls and bales. Lewis-Shepard Products, Inc. *(186J)*

Nicholson Traps Help

CUT STEAM COST $500,000 A YEAR

for This Important Plant

At one of the nation's large processing plants a campaign to promote economical steam use by improving heat transfer efficiency has resulted in a yearly saving of $500,000. Credit for a fair portion of this is given to improved steam trapping, which resulted from the installation of Nicholson thermostatic traps. To see why an increasing number of leading plants are standardizing on Nicholsons for positive drainage and faster heat transfer . . .


Type C
Type B
The two types above are cast iron; sizes ½" to 2"; pressures from vacuum to 225 lbs. Type C also in cast steel for pressures to 300 lbs.
FIVE TYPES FOR EVERY PLANT USE

Send for
NICHOLSON TRAP CATALOG 751

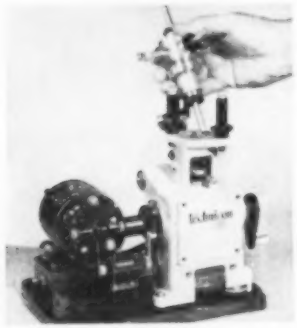
This 32-page standard reference is complete with capacity tables, installation diagrams, as well as a section containing data, charts and formulae for determining the proper size trap for specific applications.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

206 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities



Reagent Pump Delivers Tiny Volumes

(188A) The new Micro pump delivers accurately metered volumes as small as 0.001 ml. per stroke, with volume delivery instantly interchangeable during operation. Without interrupting flow, you merely turn the vernier control at the base of the pump to the setting desired. Interchangeable synchronous motors give pumping speeds of 2, 10, 25 and 30 strokes per min. Each stroke is indicated on a conveniently mounted counter.

Two chambers for different delivery ranges are available; one delivers from 0.001 to 0.1 ml. per stroke, the other from 0.01 to 1 ml. per stroke. Chambers are easily interchanged, as shown in the illustration.

Wetted parts are made in either glass or Carpenter 20 stainless steel.—*Technicon Chromatography Corp.*

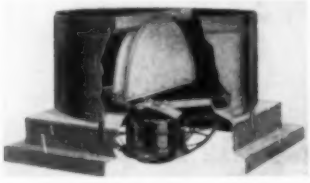
Small Volume Pump With Constant Delivery

(188B) The miniPump, an adjustable controlled volume pump for deliveries in the range of 3 to 3,200 ml. per hr., is now available in a Constametric model for services which require pulse-free continuous flow. Plungers for the liquid ends are driven by positive cams so designed that the speed of one plunger decelerates at the end of its stroke at a rate equivalent to that at which the second plunger accelerates. Maximum discharge pressure is 1,000 psi.—*Milton Roy Co.*

Tank Bushing Has Two Connections

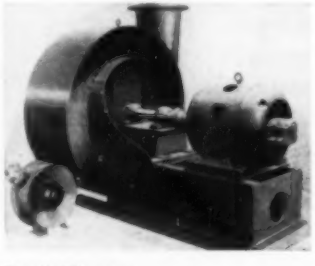
(188C) A recently announced tank bushing provides both suction and return lines in the same tank opening. It also has a tapped connection on the underside of the suction opening to permit threaded pipe installation directly into the tank.

The new bushing is made of cast iron in these sizes: ¾ by ¾ by 2 in., ½ by ½ by 2 in., and ¾ by ½ by 2 in. (Tubing sizes are O. D.) Other sizes are available upon request.—*Universal Valve Co.*



Roof Ventilator Has Straight-Through Flow

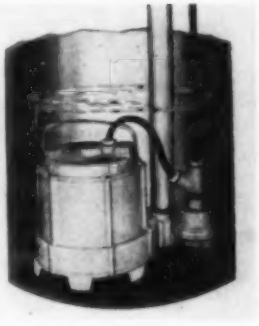
(188D) A new power roof ventilator features simplified design and low over-all height. Of the "straight-through" type, the ventilator is open only when its propeller fan is operating—the air stream opens and holds two semicircular halves of the damper. The new unit is supplied in a wide range of sizes and capacities.—*Swartwout Co.*



Steel Blowers In Large Sizes

(188E) A new line of fabricated steel blowers, ranging up to 200 hp., offers weight savings and space economy over cast construction. Modern steel cutting and continuous welding methods have made the new design possible.

Three styles are offered—Models SG (multi-stage) and SM (single-stage), operating at 3,500 rpm., and Model ST, operating at 1,750 rpm. Standard outlet pipe sizes run from 4 to 24 in., all flange fitted. Outlets may be oriented in any of 14 positions. Delivered air pressures range up to 3 psi.—*Lamson Corp., Billmyre Blower Div.*



Sump Pump Is Completely Submersible

(188F) A completely submersible pump is driven by a motor hermetically sealed in oil and controlled by an automatic floatless liquid level control switch. Principal uses of this pump are sump pumping, draining flooded areas, and draining tanks and vats.

The level switch, which has no moving parts exposed to water, turns the pump on automatically as a result of air pressure created by water rising in the switch skirt acting on a diaphragm. Pumping action sustains switch operation, making it possible to pump down to within ¼ in. of the bottom of the sump.

Driven by a ½-hp. motor, the pump has a capacity of 3,300 gal. per hr. It is 13 in. dia. by 9½ in. high and weighs 50 lb. List price is about $100.—*Kenco, Inc.*

Fluids Handling Briefs

Suction Line Strainer—Threaded for 1¼-in. pipe, will fit through a 2-in. tank opening. Liquid enters from the sides instead of the bottom. Universal Valve Co. *(188G)*

Centrifugal Pump—Made of stainless steel in 9 sizes with capacities to 750 gpm. and heads to 180 ft. Goulds Pumps Inc. *(188H)*

Steel Tubing—Precision drawn, can substitute in many places for non-ferrous tubing. Precision Tube Co. *(188I)*

Steel Valves—General purpose valves for all pressures up to 800 psi. at 750 deg. F. and OWG pressures up to 2,000 psi. at 100 deg. F. With stainless packing gland bolts, 500 Brinell stainless wedge, and integral stellite seats. Manning, Maxwell & Moore, Inc. *(188J)*

"FALL IN!"

Shouted Uncle Sam to

VISQUEEN FILM

VISQUEEN has been alerted. And like a good soldier, VISQUEEN must be ready to leave civilian life and return to Active Duty.

The same qualities that have made VISQUEEN so valuable to industry—its strength, durability, chemical inertness—are needed with constantly increasing urgency by the Armed Forces, for whom VISQUEEN was originally developed.

That may make it tough on you who have come to depend on this *distinctive* polyethylene film. Currently, not all of our production is required by the Government. And until such time as the *entire* VISQUEEN output must be devoted to Defense, we pledge ourselves to keep trying to fill your orders to the very best of our ability.

VISQUEEN* FILM... A Product of

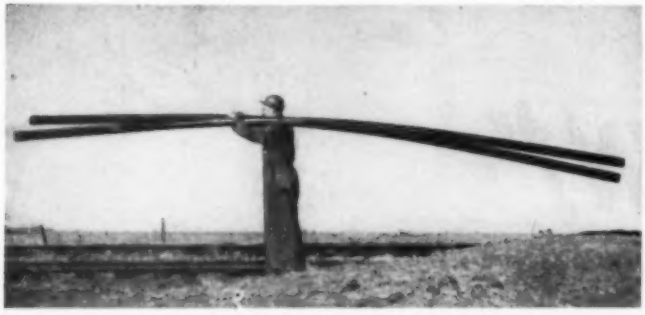
THE VISKING CORPORATION

Preston Division • Terre Haute, Indiana

In Canada: Visking Limited, Lindsay, Ontario

IMPORTANT! VISQUEEN film is all polyethylene, but all polyethylene film is not VISQUEEN. VISQUEEN is the only film produced by the process covered by U.S. Patent No. 2461975. Only VISQUEEN film has the benefit of the research and extensive technical experience of The Visking Corporation, pioneers in the development of polyethylene film. Be sure. Always specify VISQUEEN film for superior tear and tensile strength and greater uniformity.

*T. M. The Visking Corporation



LIGHT WEIGHT of Tenite pipe is evident here. One man can carry unaided two 20-ft. lengths of 3-in. well tubing.

SALT WATER line is made of 20-ft. lengths coupled with slip sleeves.

FITTINGS are made by sawing and cementing, flanges and bells by hot forming.

Tenite Joins the Parade

Add cellulose acetate butyrate pipe to those materials available for solving corrosion problems.

(190A) Although the spotlight has been focused recently on developments in the newer plastics, such as polyethylene and the vinyls, don't sell the cellulose esters short. Tennessee Eastman has been quietly exploring the possibilities of its Tenite II, a cellulose acetate butyrate, as a construction material for process uses, particularly in piping.

One of the most promising applications for Tenite piping appears to be in petroleum production. Corrosion problems here are due to salt water, sour crude, corrosive earth and electrolytic action. Tenite has been used successfully under all these conditions. It is well suited for piping salt water from separators to disposal wells. It has also been used for the well tubing itself.

Tennessee Eastman has used its own plant at Kingsport, Tenn., as a proving ground for chemical process applications of Tenite pipe. Lines now in use include a total of 1,035 ft. of 4-in. pipe carrying these materials: 12-15 percent brine; 10-15 and 28-35 percent acetic acid; cellulose acetate-water slurry; city water at 70-90 psi. Tenite is also being used for vent and drain lines and pneumatic conveyor piping.

Tenite can be produced in any degree of transparency from clear to opaque and in a choice of literally thousands of colors. Transparency is especially desirable for many process uses but, of course, means little in underground installations.

Ease of fabrication is a big factor. Tenite pipe is easily cut to length with an ordinary hand saw. Fittings are made by cutting straight pipe at the proper angles and cementing the parts together. Joints are made by cementing collars to the pipe ends. Flanges or bell couplings can be formed by heating to about 300 deg. F. and forcing the pipe ends over suitable dies.

Although Tenite is light in weight Tennessee Eastman has found that pipe hangers are needed about every 5 ft. in horizontal installations.

A bonus to users of Tenite pipe is its lower frictional resistance to fluid flow. This permits you to use, in many cases, smaller lines than would be required for steel pipe. Pressure drop measurements indicate that flow through extruded Tenite pipe is approximately 40 percent more than through clean steel pipe, for the same head loss.—*Tennessee Eastman Co.*

Plastic Liner Protects Concrete Sewer

(190B) A 48-in. I.D. reinforced concrete sewer pipe nearly 7 mi. long, now being installed in Orange County, Calif., is being lined with vinyl resin sheets. The plastic sheets, each approximately 4 by 8 ft. and 0.06 in. thick, are softened and welded into one continuous lining by a hot air torch. The pipe is being lined only ⅔ of the way around, excluding the lower quadrant, inasmuch as the gas space is the part which requires the protection.

The pipe will carry industrial and septic sewage. The vinyl lining will effectively resist the action of H_2S normally present as the result of bacterial action on both the sewage solids and sulphates in the water supply. H_2S, on oxidation, causes disintegration of concrete.—*Amercoat Corp.*

Chrome Carbide Resists Corrosion, Abrasion

(190C) A new engineering material combines high resistance to abrasion, erosion, corrosion and high-temperature oxidation. Produced from powdered metals, the new material

contains about 70 weight percent of chromium and is thus termed a chrome carbide. It has been given the manufacturer's designation Series 600.

Corrosion resistance to salt spray is outstanding. After being subjected to a 30 percent salt spray for 750 hr., test samples still retained their metallic luster. Resistance to H_2SO_4 is about 30 times that of 18-8 stainless. Resistance to HNO_3 is twice that of 18-8.

Series 600 chrome carbide appears to be highly resistant to oxidation at all temperatures up to 1,000 deg. C. Samples in the above picture were all subjected to 1,000 deg. C. for 24 hr. The chrome carbide (center) still maintained its luster, while 18-8 stainless (left) and tungsten carbide (right) completely disintegrated.

The new material will be available in the complete size and shape range in which tungsten carbides are currently offered. There are, however, no inherent physical limitations as to sizes and shapes eventually producible. —*Carboloy Dept., General Electric.*

Materials Briefs

Porous Cobalt Alloy—Haynes Alloy 25, a cobalt-base material for high-temperature service, now available in the form of porous filters. Highly resistant to HCl and wet chlorine. Micro Metallic Corp. *(191A)*

Welding Guns—Two types, gas-heated and electrically heated, for hot gas welding of thermoplastic materials such as polyethylene and PVC. Temperature of welding gas stream leaving gun can be varied from 300 to 700 deg. F. American Agile Corp. *(191B)*

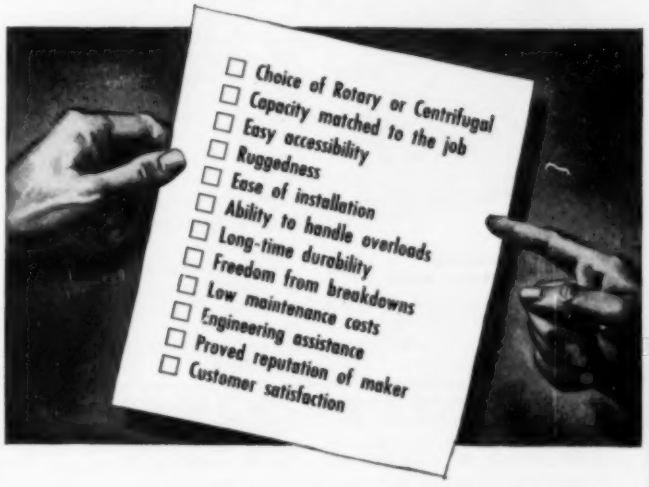
Protective Coating—Made of selected asbestos fibers, asphaltum and special oils. Available in sprayable form. Resists common acids and alkalis. Eagle-Picher Sales Co. *(191C)*

Plastic-Covered Bolts—Nuts and bolts encased in a vinyl resin sheath; can substitute for stainless steel at approximately ¼ the cost of stainless. Steere Enterprises. *(191D)*

Refractory Coating—Cermet coating for lengthening refractory life. Reduces abrasive wear, flame erosion and thermal shock. Applied by brush or spray. Williston & Co. *(191E)*

Lead-Clad Copper—Produced by a new process in which the lead and copper are drawn simultaneously and chemically bonded. Knapp Mills, Inc. *(191F)*

BEFORE BUYING *any* BLOWER COMPARE THESE ESSENTIALS



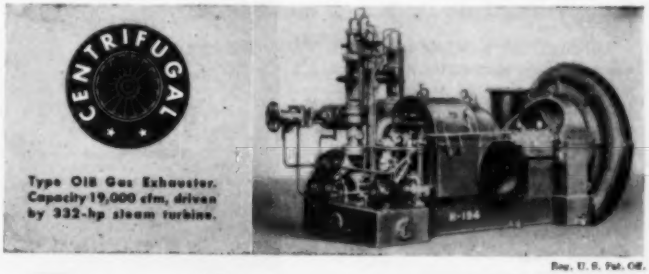
When production depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in industrial applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Illinois Avenue, Connersville, Indiana



Reg. U. S. Pat. Off.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

Magnetic Flowmeter With Zero Pressure Drop

(192A) The Magnaflow, recently developed for measuring flow rates, is based on Faraday's classic law of electromagnetic induction, which states that a voltage will be induced in any medium when moving through a magnetic field. The induced voltage is proportional to the velocity of the medium and intensity of the field.

Sensing head of the Magnaflow, shown above, consists of an electromagnet and a flow tube. Fluid moving through the tube induces a voltage which is picked up by two platinum electrodes flush with the inside wall of the tube. This voltage is amplified by electronic means and is applied to an indicating instrument.

The internal diameter of the flow tube matches that of the connecting piping. Inasmuch as there are no restrictions of any kind, there is no pressure drop other than that normally occurring in a straight line.

The Magnaflow measures flow rates with a claimed accuracy of 0.5 percent or better. The absence of moving parts eliminates all inertia. The instrument is said not to be affected by fluid viscosity, density, pressure or type of flow.

Although the principle of electromagnetic flow measurement was first published in England as long ago as 1930, considerable work has been necessary to recognize and solve the problems associated with development of a commercial instrument.—*Mittelmann Electronics Div., Century America Corp.*

Control Unit Has Rapid Response

(192B) The Tel-O-Set controller is the latest in a series of new devices designed to improve process control. Operating on a pneumatic balance principle which eliminates friction and lost motion, the unit is said to be extremely sensitive and rapid in response to process changes.

The new controller is made in two models, one with fixed proportional band, the other with adjustable proportional band. Units are constructed of a number of coded, interchangeable sections, separated by diaphragms. Air passages are drilled in the various sections. — *Minneapolis-Honeywell Regulator Co.*

Surface Thermometer Avoids External Radiation

(192C) A new surface thermometer takes the form of a flat disk 2 in. in diameter. A highly reflective evaporated mirror on the dial guards the thermal element against the effect of external radiation. Range of the instrument is 0 to 300 deg. F., calibrated in 2-deg. increments.

You can easily affix the thermometer to any flat surface by applying a small amount of silicone grease, which is supplied with the instrument, and sticking the thermometer in place. The grease does not melt and holds the instrument throughout the entire temperature range, providing a thermal coupling between the surface and the thermometer.

Also furnished is a small magnetic clamp which will hold the thermometer securely in place on iron or steel surfaces. The instrument is priced at about $5.—*Pacific Transducer Co.*

Instrumentation Briefs

Speed Indicator—New dial with extra scale divisions; new ball bearing spindle. Herman H. Sticht Co. *(192E)*

Temperature Regulator — Self-operated, packless, single seated, fully balanced, hermetically sealed. Visual control is provided by dial adjustment. Farris Stacon Corp. *(192F)*

Electric Stopwatch—Uses a high torque synchronous motor specially designed for timing. Counts in 0.1-sec. or 0.01-min. units. Laboratory Industries, Inc. *(192G)*

Instrument Winder — Crank type, makes widing of spring-driven instruments much easier than when using a key. J. A. Campbell Co. *(192H)*

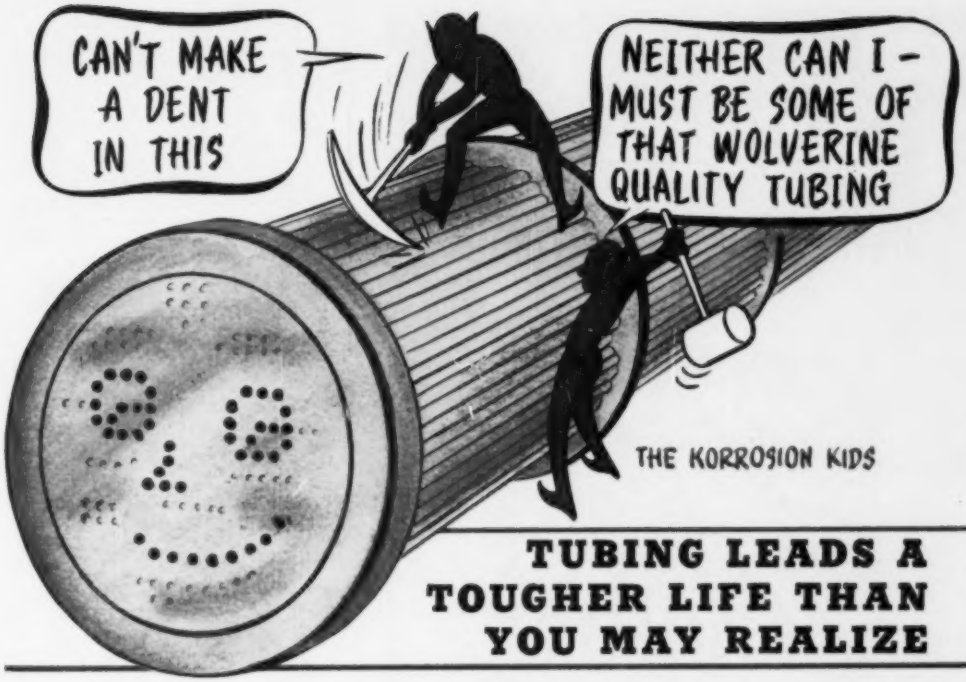
Flow Colorimeter—Makes continuous absorption measurements of a flowing liquid or gaseous stream. Beckman Instruments, Inc. *(192I)*

Scanning System—Automatically scans in sequence a large number of process variables, such as temperature, pressure, flow and level. Panascan, Inc. *(192J)*

pH Indicator—Line-operated, is unaffected by normal fluctuations in line voltage or by zero drift of amplifier. Can be provided with auto-

DUAL-PURPOSE MASS SPECTROMETER

(192D) **This new instrument, Model 21-401, is designed for the analysis of mixtures of gases and light liquids, as well as for determination of ratios of stable isotopes. Conversion from one duty to the other requires only a few minutes. For mixture analysis, 15 or more complete runs can be made in an 8-hr. shift.—Consolidated Engineering Corp.**



TUBING LEADS A TOUGHER LIFE THAN YOU MAY REALIZE

Constantly exposed to attacks of corrosion, condenser tubes lead a life of some uncertainty. Unless tube is selected with an eye to the use to which it will be put—to the specific liquids or gases it will carry—the occasions for retubing will be more frequent and your costs thus increased.

Today, in the face of short copper supply, it behooves you to be absolutely sure that your condensers or heat exchangers are equipped with most dependable quality tubes chosen with full consideration of their life expectancy under your particular operating conditions.

To that end, we invite you to take advantage of our Customer Engineering Service which is ready to help you specify the tube of proper copper base alloy to suit your specific need, in order to reduce the frequency of retubing and thereby extend your condenser operation to its maximum efficiency.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, nonferrous tubing
1427 Central Avenue · Detroit 9, Michigan

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
Sales Offices in Principal Cities

Export Department, 13 E. 40th St., New York 16, N. Y.

new Snap-on* Catalog
OF INDUSTRIAL WRENCHES AND MECHANICS TOOLS
now ready for distribution
*Snap-on is the trademark of Snap-on Tools Corporation
Snap-on
"THE CHOICE OF BETTER MECHANICS"
SNAP-ON TOOLS CORPORATION KENOSHA, WISCONSIN
Send for your copy TODAY!

This complete and well-illustrated catalog describes Snap-on's entire line of standard wrench equipment and mechanic-type maintenance tools. The most complete line of its kind! Write today for your copy and discover why Snap-on is servicing businesses everywhere with tools for more efficient production, maintenance, and service.

- **42 Factory Branches to assure prompt shipment!**
- **Facilities for production runs of special tools available!**
- **Widest range available from any one source!**

SNAP-ON TOOLS CORPORATION
8106-A 28th Avenue
Kenosha, Wisconsin

EQUIPMENT NEWS, cont. . .

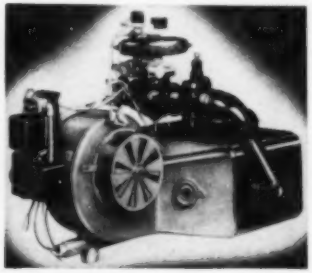
matic temperature compensation. Leeds & Northrup Co. *(194A)*

Valve Positioner—For piloting cylinder-controlled valves and similar equipment. Compact, high speed, particularly useful where long strokes and relatively large forces must be used. Foxboro Co. *(194B)*

Torsion Bar Load Cell—Will change a mechanical force into an electrical signal. Available in ranges up to 2,500 lb. Automatic Temperature Control Co. *(194C)*

Absolute Pressure Transmitter—Consists of two opposing bellows connected to a cantilever beam spring and a differential transformer. Available in five standard ranges between 0-50 mm. and 0-30 in. Hg. Accurate within 0.5 percent of full range. Automatic Temperature Control Co. *(194D)*

NEW HEATING & COOLING EQUIPMENT



Forced Draft Burner In Package Unit

(194E) The new Model 214 forced draft burner is produced in 11 capacities ranging from 400,000 to 20 million Btu. per hr. input. It is shipped factory wired and assembled as a unit. Featured as standard equipment are such controls as automatic electric ignition and electronic flame failure protection, on-off or throttling-off diaphragm valves, constant air-to-gas ratio shutter, ceramic burner face and centrifugal fan.—*Bryant Industrial Div.*

Heating Mantle For Large Drums

(194F) Electric heating mantles, widely used in laboratory work, are finding their way into the plant. You

can now get them large enough to cover 55-gal. drums. Two circuits are provided—2,000 watts each at 230 v. The heating element is a resistance wire woven into glass fabric.—*Glas-Col Apparatus Co.*

Compressed Fuel Torch Requires No Pumping

(195A) A recently introduced compressed fuel torch gives 3 hr. of full-blast flame from one disposable self-pressurized container of hydrocarbon fuel. No pumping, priming or pouring is necessary.

The torch is supplied with two interchangeable tips, one for a full bushy flame, the other for a fine pin-point flame. The length of flame is 5 in. with either burner at full opening. Flame temperature is 2,200 deg. F.

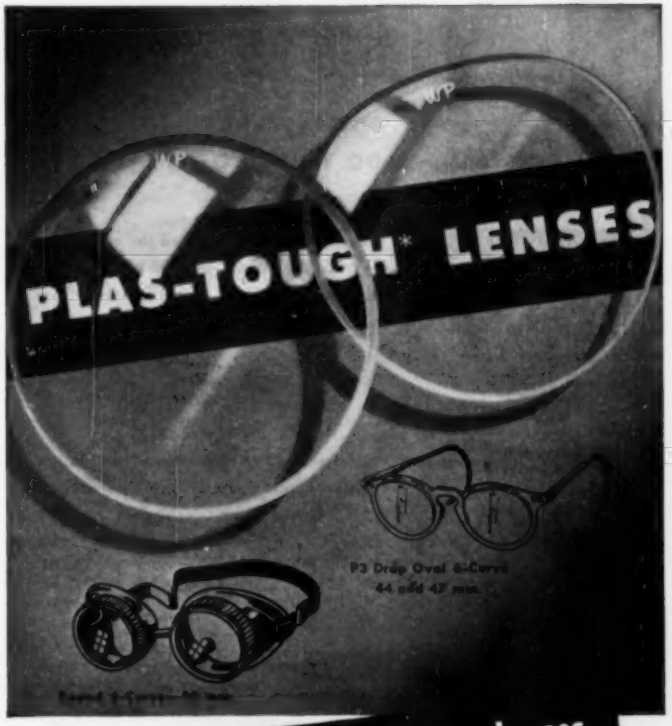
Weighing only 1¼ lb., the torch can be used in any position and is suitable for indoor or outdoor work. A kit consisting of two burners and one can of fuel is priced at about $15. Additional fuel sells for $1 per can.—*Emil Greiner Co.*

Condensate Return Unit With One or Two Pumps

(195B) The new Motor-Mount condensate return unit comes either in single or duplex models. Single units include pump, motor, storage tank, suction piping, float switch and water level gage. Duplex units have two pumps, two motors, one tank, one

(Continued)

New WILLSON®



Only Half the Weight of Glass Lenses

- Newly developed, extra tough plastic
- Meets existing Federal Specifications for impact resistance and light transmission
- Improved surface hardness gives unusual resistance to pitting, scratches, abrasion and common industrial acids that mar ordinary plastics
- Light weight gives greater wearing comfort

*Trade-Mark

See your WILLSON distributor or write us direct
WILLSON PRODUCTS, Inc., 106 Thorn St., Reading, Pennsylvania
Dependable Products Since 1870

DO YOU KNOW WHAT WE'RE DOING IN

ION-EXCHANGE?

FOR INSTANCE, DO YOU KNOW THAT DORR

[redacted] designed the plant, supplied the equipment and supervised the initial operation of the biggest ion-exchange installation ever installed for purification of waste fruit juices?

[redacted] a two-stage D-I System for the recovery and purification of a new organic chemical; process developed by the client . . . equipment supplied by Dorr?

[redacted] ideal for the production of 100 to 1000 gallons per hour of high-purity water at low cost . . . as demonstrated at an East Coast pharmaceutical plant where D-I water is costing but 13 cents per 1000 gallons?

These are typical examples of our work in ion-exchange . . . indicative of the scope of our service and equipment range. If you are currently exploring the possibilities of ion-exchange for new processes or those already established, we will be glad to work with you on any basis you desire. And our ion-exchange facilities are backed by solid experience in chemical engineering.

Bulletin 4081 hits the high-spots of Dorrco D-I Systems. Address your request to Ion-Exchange Division, The Dorr Company, Engineers, Barry Place, Stamford, Conn.

DORR

THE DORR COMPANY · ENGINEERS · STAMFORD, CONN.

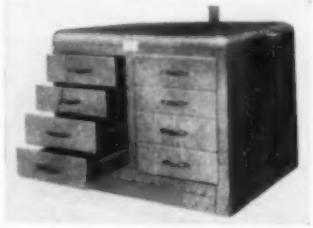
alternator switch and one level gage. A selection of 44 sizes handles from 2,000 to 40,000 sq. ft. of radiation.

The pumps have enclosed bronze impellers and stainless steel shafts. Pump is mounted on the legs of the tank so that no base is required.—*Deming Co.*

Electric Oven Keeps Welding Rod Dry

(196A) A new portable electric oven is specifically designed to protect mineral-coated welding electrodes against moisture. Moisture absorption results in faulty welds. Rather than scrap electrodes which have been exposed to moist atmospheres, you can dry them out before use with this handy oven.

The oven is basically a cylindrical, compartmented sheet metal unit, heated by an 840-w. element operating off a 110 or 220-v. circuit. A variable thermostat gives close control on temperatures up to 600 deg. F. Dimensions are 22 in. O.D. by 25¼ in. long.—*Philip Roden Co.*



Electric Oven Has Sliding Drawers

(196B) A new portable electric oven has eight drawers that permit processing of different materials at the same time or materials inserted at intervals. Magnesium strip heaters provide controlled and adjustable temperature up to 325 deg. F. A motor-driven fan provides forced air circulation. The unit operates on 110 v. Several ovens can be stacked in a battery.—*Grieve-Hendry Co.*

—*End*

DORRCO DOINGS IN 1951

The year is ending with many changes of fundamental importance. England's new administration, though facing colossal problems, naturally makes believers in Free Enterprise more hopeful. Millions of us here today are thrilled by the hope that we can vote for a really great man, one like our first president, a great general, but above all an able and very wise patriot. No one believes that he would leave his present duties unless he felt that as president he could better serve his country and the world. It is inspiring to realize that he certainly can count on our strongest leaders to help build his team. A statement last year, that "America was in greater danger from within than without," is recalled when we think of the disclosure of lamentably lowered standards in many areas – a normal product, I would say, of stressing the doctrine that the State "owes" so much to all its citizens rather than that the citizen owes services to the State, if Democracy is to survive.

* * *

ABROAD– As here, our associates in Europe have had their greatest year. Among our projects starting this year were Colne Valley Sewage Plant, west of London, one of the largest sludge filtration and drying/incineration plant in the world, and a large metallurgical plant for Mines de Bor in Yugoslavia.

RELIEVING THE SULPHUR SHORTAGE– Sulphuric acid manufacturers, sulphite pulp producers and other users of sulphur dioxide, faced with a world-wide shortage of elemental sulphur, have found the Dorrco FluoSolids System an economically feasible means of utilizing iron sulphides as an alternate source of SO_2 gas. Using pyrite running 48-50 percent sulphur and yielding a gas averaging 14-15 percent SO_2, or pyrrhotite with lower sulphur content and yielding a slightly weaker gas, FluoSolids has brought both installation and operating costs down to a reasonable level. Concurrently, development work continues in such fields as the calcination of water softening and chemical pulp mill lime sludges; the sulphating roasting of copper concentrates prior to leaching and direct electrolytic precipitation without smelting; and the roasting of zinc flotation concentrates for either electrolytic, retort or zinc fuming operations.

WORLD'S LARGEST TRICKLING FILTERS–The revitalized sewage treatment plant of the City of Baltimore, Maryland, now has 30 acres of trickling filters, served by 50 Dorrco Sewage Distributors, each 157 ft. 6 in. in diameter and designed to handle a total flow of 112 million gallons per day. Our association with this new "world's largest" dates from 1930 when we sold the city its first Dorr Clarifiers which are still in service.

ION-EXCHANGE– Two large Dorrco De-ionization Systems are scheduled to start up about the end of the year, purifying organic chemical solutions. Regardless of the nature of specific applications, we supply a complete, integrated service for handling all kinds of ion-exchange projects from the initial analysis of the problem to the starting up of the new installation.

DORRCO AERATOR-CLARIFIER– The new combination of two well-known principles has demonstrated its worth at Idabel, Oklahoma, and elsewhere. It fills a real need wherever it is desired to increase present removals of suspended solids and BOD'S–wherever odor control is a necessity–or where flocculation, with or without chemicals, is beneficial. It is readily adaptable both to primary and secondary treatment.

INDUSTRIAL WASTES – Greater attention is being given to solutions of this problem as business executives realize good public relations require that their plants create no offense and furnish effluents comparable with those of domestic treatment systems. Significantly, many large companies have appointed engineers with the sole responsibility of caring for their plant effluents.

DORRCO VACUATOR – This versatile sewage pre-treatment unit has this year convincingly demonstrated its worth and flexibility. One installation in Oklahoma removes scum, grit and some suspended solids from raw feed. Another, in California, pre-treats various trade wastes ahead of the municipal treatment plant. Still another, in Maryland, acts as a grease removal device.

CONSULTING ENGINEERING– During the year, Dorr-designed plants for producing the first triple superphosphate in England and magnesia from sea water in Norway were put into operation. Design jobs abroad have included a copper leaching installation in the Near East, a triple superphosphate plant for Greece and a phosphoric acid plant for Switzerland. Projects in this country covered such diversified operations as recovering blast furnace flue dust, remodeling a large gold cyanide plant, and producing SO_2 gas for the manufacture of sulphite pulp.

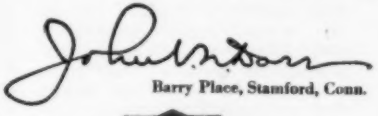
INDUSTRIAL WATER – The largest single equipment order booked in our history, will be used for industrial water purification in an amount approximating that daily used in New York City.

* * *

The high point for me in 1951 was a quick month spent in Europe revisiting most of our Associates. It was my first trip since '48 and I found great improvement both in physical conditions and in the mental attitude of all we met. Most interesting was a three-day session in honor of the completion of our new office building at Herengracht 478, Amsterdam. Three hundred years old and full of the dignity and real beauty of an older period, when merchants both worked and lived in the same home, it has been remodelled for our needs with loving care. Our group, foregathered there, represented twelve nations.

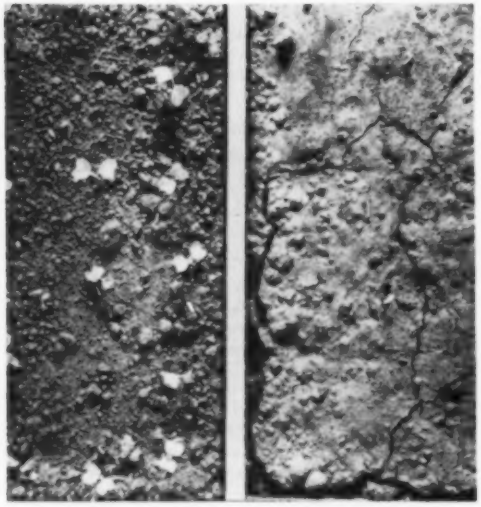
In Paris and Wiesbaden new and larger offices have been acquired and all our staff, crowded with work, bear testimony to their efficient organization and cooperation, and to the improved conditions in Europe.

It has been a busy year, with our organization keyed to meet the expansion inevitably brought about by world activity. We all join in sending New Year's Greetings to our Staff, Associates, and friends Worldwide, with the strong conviction that while "the impossible takes a little longer," it will be done, and that we can now see ahead, dimly perhaps, a picture of the World as we would wish it.

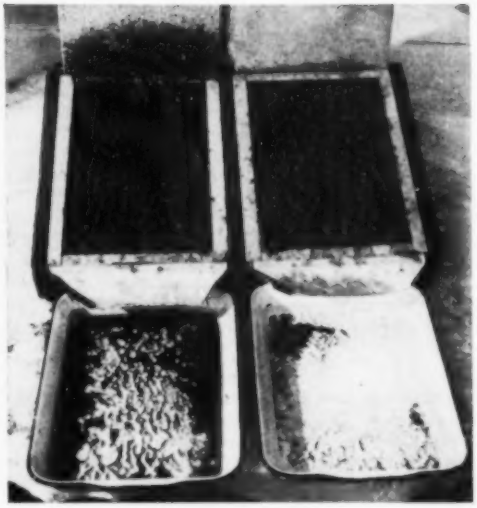


Barry Place, Stamford, Conn.

DORRCO



CRUSTING in treated soil, was cut down sufficiently to cause the dramatic contrast in radish growth shown above.



WASHING AWAY of treated soil, right, is shown to be negligible after a half hour of simulated rainfall.

Chemical Strikes At Soil Erosion

Krilium promises higher crop yields via stabilization of good soil structure. Instead of forcing Nature to do the job, the new soil additive stands in for her. (198A)

Before long, crops may flourish on hard baked alkaline and saline land like that in parts of Arizona and Oregon. That's among Monsanto's high hopes for its new soil additive. Behind these hopes: outstanding erosion resistance and workability which have earmarked treated soils during almost three years of testing.

The additive, called Krilium, is the sodium salt of acrylonitrile. During its manufacture, acrylonitrile is polymerized then hydrolized by a novel process.

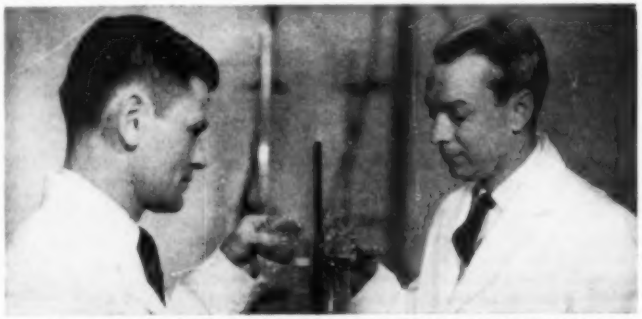
Krilium brings about the following: more rapid infiltration of rain into the soil, no slaking and less run off, lower evaporation. As much as three fourths more water may be made available to the plant. That insures a much higher percentage of seed germination to which moist soil is absolutely essential. Hard crusts cease to hinder plants from making their way through the ground.

Splash impact of raindrops and the scuttering of running water are the two major sources of soil erosion. Since Krilium-treated soil has a loose-type surface that rolls with the punch when a raindrop lands, there is much less run-off. During a test in which a 2-in.-an-hr. artificial rain was dribbled on treated and non-treated soil, the latter nearly splashed and washed away. Water running off the Krilium treated material was virtually clear. In some cases the run-off of untreated soil was as much as 33 tons per acre; treated with Krilium it was approximately 1 ton.

Improved workability of the soil is another factor. It's easier to plow and to dig, requires less disking and harrowing after plowing.

Commercial production will be underway by the beginning of 1953. The plant will be in Texas City where the company has its acrylonitrile plant.

Monsanto plans to make 250,000 to 500,000 lb. of Krilium this year. Most of this will be distributed for experimental purposes. Limited test marketing is a possibility for the latter



Investigators R. M. Hedrick and D. T. Mowry, left to right, headed Krilium search.

part of 1952. A pilot plant in Springfield has been producing a maximum of 20,000 lb. a month. Most of the tests have been conducted with the cooperation of the Dept. of Agriculture and similar organizations.

Basically, what Krilium does is to improve on nature's method for making soil aggregates. The most fruitful land has soil varying in size from a pinhead to a pea. Krilium creates just such a spongy water absorbent aggregate.

Less efficient are nature's soil binders. They are the polyuronides formed in trace amounts by decomposition of vegetable matter. However, humus and the natural gums derived therefrom break down rather rapidly by further bacterial effects. Krilium does not. To force nature into creating proper soil structure, farmers use tons of organic additives like peat moss and manure. So economically, 1 lb. of Krilium turns out to be equivalent to the derivative of hundreds of pounds of these additives.

Initially Monsanto plans to sell Krilium at a price under $2 a lb. They claim this makes it about 6 to 10 times less in terms of use cost than peat moss. One pound of Krilium is equal to 200 to 1,000 lb. of peat moss and the price of peat moss is about 4 c. a lb.

There is a possibility that Krilium may have industrial uses—in sewage beds to spread the flow through infiltration and perhaps as a flocculant. It may pan out in the chemical process industries for conditioning of paste materials.

It may hold promise in paper mills by upping the percentage of clay which may be incorporated in paper at the beater. With cellulose as short as it is, this could be significant.

Right now this much is for sure—Krilium looks pretty hot for agricultural use and for erosion prevention. But Monsanto emphasizes that there is still a great deal of work to be done.

Aconitic Acid

For use in preparing esters, acid esters, synthetic resins. (199A)

C. P. Hall Co., Chicago, has started up a semi-commercial unit for the production of aconitic acid.

An unsaturated, tribasic acid, aconitic can be used to prepare esters, acid esters, normal and acid salts, amides and acid chlorides. Since it has a double bond, interesting additions can be made at this point. Being unsaturated it is of interest for preparing special synthetic resins. Plasticizers made from aconitic have light stabilizing properties, good solvent properties and are of satisfactory volatility. The acid can also be used for the manufacture of synthetic wetting agents, intermediates and used for synthesis.

C. P. Hall Co. is using a new patented process to derive aconitic from citric acid by a dehydrating reaction at the position of the double bond. A white crystalline powder with a melting point of 195 deg. C., the product is odorless and readily soluble in water and alcohol.

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .	It's Good For . . .	See Page . . .
Soil Stabilizer	Making three fourths more water available to plants	198A
Aconitic Acid	Preparing esters, special synthetic resins	199A
Neoprene Cement	Non-skid, chemical resistant flooring	199B
Alkyl Phosphites	Lubricant additives, plasticizers	199C
Surface Active Agents	Making stable oil-in-water systems	200A
Soil Solidifier	All soils even those which are 50 percent leaf mold	200B
Vulcanizing Agent	Reducing scorch, prevulcanizing in furnace black stocks	202A
Herbicide	Erasing dense growths of mixed grasses	202B
Silage Preservative	Stopping bacterial action in cut grass	204A

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers.

Neoprene-Cement Flooring

Its non-skid, spillage resistant qualities make future applications in chemical plants a good bet. (199B)

A special water-setting cement to which 10 percent of neoprene latex is added has already proved its superiority in textile, sugar and powder plants. Du Pont now has chemical resistance tests under way to further document its confidence in the material's potential in chemical plants.

In the actual installations the flooring, trowelled on ¼ in. thick, withstood some rough service. It has not worn through. It has not chipped or cracked. It has not come loose from the sub floor. Although subjected to considerable and various corrosive spillage (i.e. oil, sugar) it has shown no signs of deterioration.

Some of the applications have exploited such properties as waterproofness, flexibility, ability to be made conductive for dissipation of static electricity, ability to be modified for a particular job (as by addition of cork for extra resilience). The floor has enough give to make it markedly easier on the feet than ordinary cement. Its neoprene content makes it much less slippery.

The composition can be applied over an old wood-block or steel-plate floor as well as concrete. It is mixed on the spot in proportions prescribed by the manufacturer, Crossfield Products Co., Elizabeth, N. J. Du Pont supplies them with the neoprene.

Alkyl Phosphites

Series of six show promise as lubricant additives, plasticizers. (199C)

Now offered in limited commercial quantities by Virginia-Carolina Chemical Corp. are diethyl hydrogen phosphite, dibutyl hydrogen phosphite, di-2-ethylhexyl hydrogen phosphite, triethyl phosphite, tributyl phosphite, tri-2-ethylhexyl phosphite.

As additives to lubricating oils they are efficient as corrosion inhibitors, stabilizers and anti-oxidants. They reduce wear and corrosion of bearings. They look promising as additives to extreme-pressure lubricants to improve viscosity, film-strength, load-carrying capacity and penetrability.

Tests have shown some of these materials to be useful as stabilizers and plasticizers in cellulosic materials. Their high solvent action on most organic materials qualifies them for use in many special solvent problems.

Selective reactions with organic and inorganic reagents make them interesting for the introduction of phosphorus into an organic molecule. They can be used in the preparation of phosphates, phosphonates, thiophosphates and other organic compounds of phosphorus for use in dyestuffs, pesticides, pharmaceuticals, lubricants and plastics. *(Continued)*

Surface Active Agents

Three dialkyl sulphosuccinates with good emulsifying power for making stable oil-in-water systems. (200A)

Three new esters of sodium sulphosuccinic acid are now being offered in trial-lot quantities by the American Cyanamid Co. These surface active agents are homologues of the well-known bis(2-ethylhexyl) sodium sulphosuccinate (Cyanamid's Aerosol OT).

Known as agents BO, TR, and BPE, they are relatively unreactive and are quite stable thermally. They lose none of their valuable properties at temperatures above 100 deg. C.

Both agents BO and TR have high oil solubility which particularly suits them for the preparation of oil-in-water emulsions. Such properties should make these sulphosuccinates useful in perfumery, in the dye industry, the wet finishing of textiles, paper products and insecticides. They may also be considered for use in paint manufacture and in agricultural sprays and powders for wetting and dispersing.

Agent BPE has slightly greater water solubility than the other two and is particularly useful for preventing the fogging of optical surfaces. Dissolved or dispersed in the aqueous phase, this ester also aids in the formation of stable oil-in-water emulsions. Agent BPE has high calcium tolerance, good foaming ability and good wetting power, particularly at high temperatures.

Mud swallows up man's feet like this until you add . . .

. . . briquets of the mud, bichromate and sulphite liquor.

New Slant on Solidifying Mud

Not quite a magic wand to wave over a sea of mud, briquetting process does lick long-standing problems. (200B)

To date most people think of soil solidification in terms of a continuous layer on top of soft ground. At Cornell, however, researchers have found that briquetting offers a new and promising approach to the problem.

The briquets are made on the spot out of the local soil, an inexpensive chromium compound and sulphite liquor. The synthetic gravel produced will not disintegrate after six month's submersion in water, withstands freezing, thawing and drops from a three-story height.

Commercially, this chrome-lignin process looks particularly good for temporary duty and in special cases in permanent construction. The product probably could not compete with natural gravel, but there are numerous areas where natural gravel is non-existent. Costs are roughly competitive with stabilization of soils with cement or asphalt, but the process is effective where these other methods very often are not. Clay, described as the most difficult soil to handle, can be controlled by the process. In fact, it works with all soils tested so far, even when the dirt is 50 percent leaf mold or cow manure.

Synthetic gravel can be produced quickly and in quantity—some 30 truckloads from one truckload of chemicals. Briquetting machines now on the market can be mounted on trucks for ready transportation.

Sulphite liquor, a waste headache to pulp producers, has been used for years for laying dust and for temporary stabilization of muddy roads and highway shoulders. Its water solubility has limited its value. Mixed with potassium or sodium bichromate it forms a water-insoluble jelly. This is what gives the cohesive strength to soils, makes them impervious to water.

The process has another angle with intriguing implications. Solutions can be poured on dry sand as an almost water-thin liquid which penetrates 3 or 4 or 6 in. deep. Within minutes it sets to a tough rubbery surface which will support heavy equipment. Other attempts to do the same thing have failed because the more viscous chemicals did not penetrate more than half an inch or so.

Developers of the process are Julian C. Smith and B. K. Hough, both of Cornell. Their research is sponsored by the Army Engineer Corps.

An important message for users of filter aids and mineral fillers:

JM

Johns-Manville Announces a 40% increase in Celite* production

AT A TIME when many vital materials are in short supply, Johns-Manville is pleased to announce that the culmination of two-and-one-half years of planning, designing and construction has resulted in a 40% increase in the production of its diatomite filter aids and mineral fillers.

Carefully processed from a huge and exceptionally pure deposit of diatomaceous silica, Celite products will continue to meet the strict standards of quality established by Johns-Manville in the past.

We sincerely appreciate the co-operation of all our customers during the period when the supply of Celite was limited. And we pledge ourselves to co-ordinate our own plans for future expansion with your requirements so that Celite will always be available when needed.

For further information about Celite and its availability for your process, write Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

Johns-Manville CELITE
FILTER AIDS AND MINERAL FILLERS

WHERE'S THE FIRE?

There are danger spots in every building (yours, too!) where fire is most likely to strike. These spots can be guarded day and night by a Kidde Automatic Fire Extinguishing System.

At the first sign of flame the Kidde system releases carbon dioxide (CO_2) which blankets the fire—literally smothers it instantly. You can protect several spaces with a single Kidde system...or have separate protection for such hazards as a dip tank or generator.

With a Kidde System, there is no water damage, no messy residue to ruin costly machinery, electrical equipment or documents. And that means no interruption in production. Find out more about Kidde Fire Protection today. Write to:

Walter Kidde & Company, Inc.
128 Main Street, Belleville 9, N. J.

Kidde

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Vulcanizing Agent

To replace elemental sulphur in natural and synthetic rubber furnace black stocks. (202A)

Sulfasan R, as opposed to free sulphur, reduces scorch or prevulcanizing that occurs in high modulus and high abrasion furnace black stocks. An organic sulphur-containing compound, 4,4'-dithiodimorpholine was developed by Monsanto's rubber chemicals department and is now available in commercial quantities.

Sulfasan R is said to delay the scorch time over free sulphur two- to three-fold at processing temperatures of 135 deg. C. It gives equally high modulus and tensile values at vulcanizing temperatures of 145 deg. C. It also imparts improved aging characteristics to rubber stock containing furnace blacks.

Total sulphur content of rubber stocks containing Sulfasan R is less than half that required to obtain equivalent cured physical properties when using free sulphur. Sulphur is 2.5 percent compared ith 0.7 to 1.0 percent sulphur equivalent in Sulfasan R.

Herbicide

Non-flammable killer of many perennial weeds as well as practically all annual needs. (202B)

A limited quantity of CMU in the form of an 80 percent wettable powder is to be made available in 1952 for industrial applications only. It is being produced at the Cleveland, Ohio, plant of Du Pont's Grasselli Chemicals Department.

Extensive tests have shown it to be a non-selective killer which erases dense growths of mixed grasses and broad leaf weeds leaving only an expanse of bare soil. There have been reports of its success against Johnson grass, Bermuda grass, quack grass, cereal grains, pasture grasses and tomatoes.

CMU is non-flammable, non-corrosive and shows an extremely low order of toxicity to warm-blooded animals. It is proposed for use around locations where total removal of plant growth is desirable to eliminate fire hazards.

Relatively non-volatile, it has been applied as a spray using the wettable powder dispersed in water. CMU appears to be absorbed into the root system of the plant, then moves upward into the foliage. First effects are usually noticed from 3 to 10 days after treatment. Tips of leaves began

EXTRA QUALITY . . . "in the bag"

For Surface Coatings Formulated with . . .

Preference for PENTEK as THE polyhydric alcohol in paints, varnishes and lacquers is based on proven advantages:

- **increased surface hardness and toughness.**
- **increased resistance to water and soap.**
- **prolonged retention of color and gloss.**
- **reduced production time and material costs.**

The extra quality of PENTEK—pioneered by Heyden research—is maintained by continuing engineering advances and strict laboratory control.

If you are not already familiar with what PENTEK can do in your alkyd resins, synthetic drying oils, rosin esters and tall oil esters, write now for samples and illustrated brochure.

PENTEK is packed in strong multi-wall paper bags, 80 lb. net, to facilitate handling and conserve storage space.

• • •

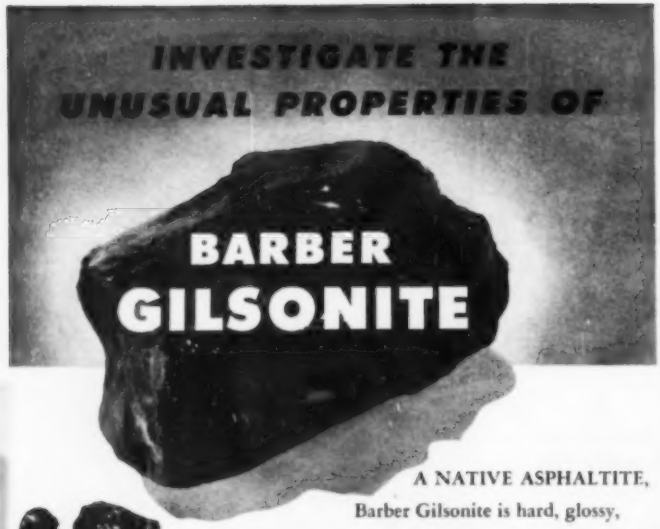
Investigate also these related polyhydric alcohols:

DIPENTEK®
Dipentaerythritol, Technical

TRIPENTEK®
Tripentaerythritol, Technical

FINE HEYDEN CHEMICALS

HEYDEN CHEMICAL CORPORATION
393 SEVENTH AVE., NEW YORK 1, N. Y.
CHICAGO • PHILADELPHIA • SAN FRANCISCO • DETROIT • PROVIDENCE



A NATIVE ASPHALTITE, Barber Gilsonite is hard, glossy, brittle, and has an extremely high melting point. Chemically inert, Barber Gilsonite may have important values in your processes. We'll be glad to supply samples and specific data promptly on receipt of your request.

5 USEFUL GRADES

BARBER GILSONITE SELECTS L
Melting Point Range 270-300° F.

BARBER GILSONITE SELECTS PULVERIZED
Melting Point Range 280-310° F.

BARBER GILSONITE SELECTS VB
Melting Point Range 325-365° F.

BARBER STANDARD GILSONITE S
Melting Point Range 280-310° F.

BARBER STANDARD GILSONITE E
Melting Point Range 335-375° F.

IMPORTANT INDUSTRIAL USES

- BUILDING MATERIALS • Barber Gilsonite is used as an important ingredient in building materials; floor tiles; building boards and paper; protective coatings and roofing lines.
- MOLDED PRODUCTS • Barber Gilsonite is a principal component in battery cases and other thermoplastic molded products.
- ELECTRICAL PARTS • For its high insulating value, Barber Gilsonite has wide application in electrical products and insulating varnishes.
- SPECIAL APPLICATIONS Wax and rubber compounds Printing Inks • Sounds and weather-proofing materials • Pipe Coatings • Chassis paints • Brake and clutch linings.

AMERICAN Bitumuls & Asphalt COMPANY

200 BUSH ST. • SAN FRANCISCO 4, CALIFORNIA

Providence 14, R. I. Perth Amboy, N. J. Baltimore 3, Md. Columbus 15, Ohio
St. Louis 17, Mo. Mobile, Ala. Baton Rouge 2, La. Tucson, Ariz. Inglewood, Calif.
Oakland 1, Calif. Portland 7, Ore. Seattle, Wash. Washington 6, D. C. San Juan 23, P. R.

to die, there is general discoloration of foliage, plant growth slows to a stop and the plant dies.

The CMU is short for 3-(p-chlorophenyl)-1,1-dimethylurea. It is synthesized by reaction of p-chlorophenyl isocyanate with dimethylamine. The product melts at about 170 deg. C. It is an essentially neutral, stable substance.

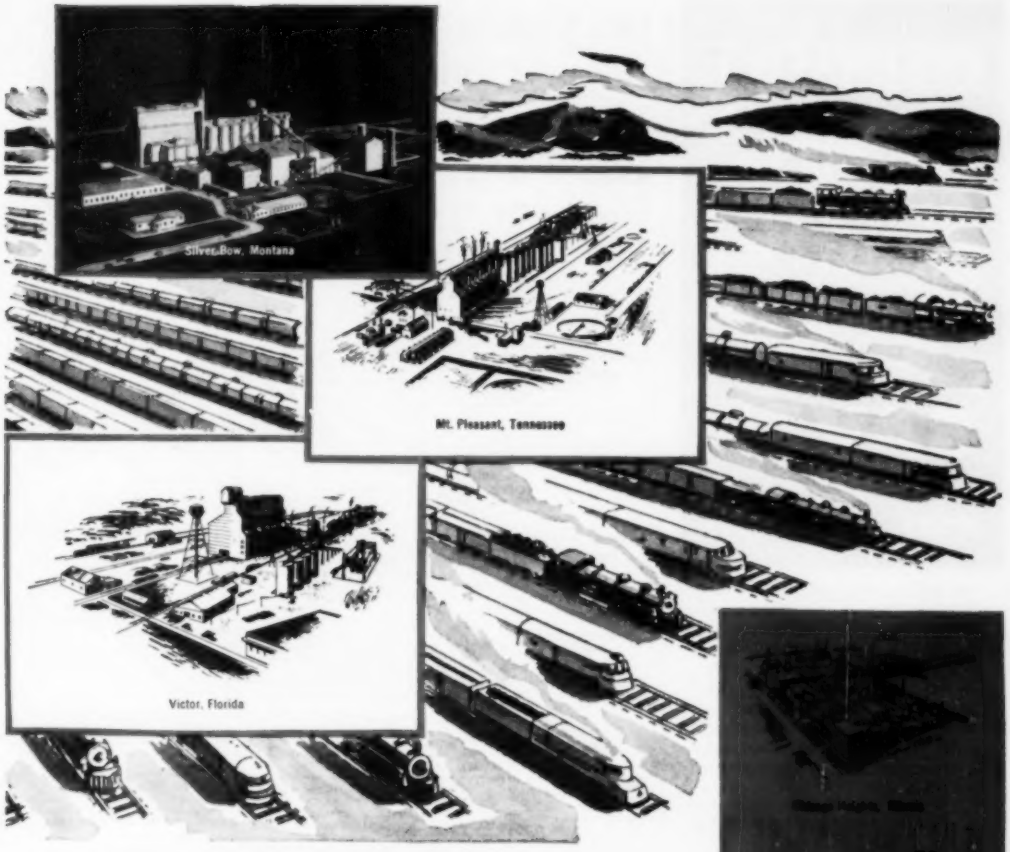
Silage Preservative

A new market for SO_2. Injecting the liquid gas into fresh cut grass stops bacterial action. (204A)

Sulphur dioxide combines with the moisture in silage to form a weak acid which stops bacterial action indefinitely. Ansul Chemical Co. states that the treated grass retains its nutritional value and tastiness for cattle. The company will market the liquid gas to farmers under the name, Grasaver Gas.

Older preservatives depend on fermentation to stop bacterial action. This fermentation reduces the total digestive nutrients in the silage. Two years of tests at universities, state colleges and farms showed that when sulphur dioxide was used there was no fermentation. The grass not only retained more of its original nutrients but the texture, flavor and odor of fresh cut grass.

The method of injecting the sulphur dioxide is simple. The chemical is shot into the ensiled crop with a copper lance at 2-ft. intervals at depths of 1 to 5 ft. Only about 6 lb. of the chemical are required to treat a ton of grass. Studies made at Penn State concerning the comparative cost of various preservatives showed savings of up to $2 a ton for silage treated with sulphur dioxide.



a new advantage for you from VICTOR

Victor's first electric furnace unit at Silver Bow, Montana, is completed and production of elemental phosphorus has begun.

The Silver Bow plant, plus the one in Tennessee, and the one in Florida puts Victor in the unique position of being the *only* manufacturer in the industry with three widely separated plants, producing elemental phosphorus. Now only Victor protects your line of supply with 3 separate sources of labor, power and transportation.

The increased quantity of phosphorus produced at Silver Bow is being used to supply Victor's expanded processing plants in Illinois, Tennessee, Pennsylvania, and California. These added facilities will enable us to produce more chemicals, of highest quality, making possible even better service to you!

Write today for Victor's catalog of phosphates, formates, and oxalates. Please write on your company letterhead.

VICTOR CHEMICAL WORKS
141 W. Jackson Blvd. Chicago 4, Illinois
A. R. Mass Chemical Co., Division,
4570 Ardine Street, South Gate, Calif.

ANTHRAFILT*

Is the HARD COAL FILTER MEDIUM that SAVES IN many, many ways

You save in many ways when you use ANTHRAFILT*. . . an outstanding hard coal filter now enjoying widespread use in industry. No water soluble constituents remain in ANTHRAFILT* to contaminate or contribute tastes or odors to filtered solutions. The reason: practically all minerals other than the inherent ash are removed during preparation. Filters acetic and sulfuric acid, caustic soda solutions, boiler condensate, sanitary and process water.

ANTHRAFILT*

provides:

- GREATER CAPACITY
- LONGER FILTER RUNS
- CLEANER WASHINGS AT LOWER COST
- REMOVES ENTRAINED TURBIDITY FROM INDUSTRIAL PROCESS SOLUTIONS OR WASTES

We invite you to write us today for full details and recommendations. A prompt reply is assured.

PALMER FILTER EQUIPMENT COMPANY
822 East 8th St., P. O. Box 1635, Erie, Pa.

*Trade Mark Reg. U. S. Pat. Off.

ANTHRACITE EQUIPMENT CORPORATION
Anthracite Institute Building
WILKES-BARRE, PA.

CE's Guide to *NEW TECHNICAL LITERATURE*

Reader Service numbers. Circle them on the postcard inside the back cover to get free booklets.

What's New In . . .	How To . . .	Company . . .
Instruments 206A	. . . find superpressure and catalytic hydrogenation apparatus for pressures up to 100,000 psi. and temperatures up to 1,000 deg. F. Cutaway drawings, photographs, specifications and operating data on such equipment as hydrogenation apparatus, reaction vessels, pumps, compressors, gages, valves, fittings, controllers as well as complete pilot plants for use on a laboratory or semi-works scale. 88 pages.	American Instrument Co.
Closures 206B	. . . choose from a complete line of closures and mechanical seals for rotary shafts. Photographs show construction, sketches show typical applications, charts give complete data on sizes and part numbers. 100 pages.	Garlock Packing Co.
Mills 206C	. . . supply your plant needs from a variety of ball, tube and rod mills. They operate on a continuous principle, are adaptable to wet or dry grinding. Over 50 illustrations. Charts showing size, weight, linings, ball charge, speed, power requirements and motor sizes. Discussion of complete continuous grinding systems. 28 pages.	Patterson Foundry & Machine Co.
Lighting 206D	. . . find specific lighting units designed and engineered for specific purposes. Product illustrations, cross-sectional drawings, candlepower distribution curves. Performance, application and installation data. Principles of light control with this company's prismatic glasses. 64 pages.	Holophane Co.
Thickeners 206E	. . . solve sedimentation problems in chemical, metallurgical and industrial processing. Covers major types of Dorr thickeners with text, drawings, photographs and size ranges. Includes sections on control devices, special designs and the company's engineering service. 28 pages.	Dorr Co.
Instruments 206F	. . . put automatic data analysis into action. Photographs of various types of computing instruments, how they fit into various industries. 16 pages.	Telecomputing Corp.
Gas Diffuser 206G	. . . maintain practically constant permeability for fine diffusion of air or gas in sewage and industrial waste treatment, water conditioning, biological manufacturing processes, absorption processes. Illustrates and describes a flexible, collapsible diffuser. 4 pages.	Infilco Inc.
Conveyors 206H	. . . get your pulverized materials to flow like water with this company's Airslide conveyor. Several photographic sequences show its use in different industrial applications. 8 pages.	Fuller Co.
Ion Exchange 206I	. . . do your ion exchange calculations easily with a slide-rule type cardboard device. Chart A converts parts per million to grams per gallon or vice versa; it also enables you to convert your analysis to $CaCO_3$ equivalent. Chart B gives size and operating data of this company's mixed-bed deionizers to meet specific requirements.	Illinois Water Treatment Co.
Alloys 206J	. . . tickle the funny bone and warm the heart of many a somber company executive. The story of "Alloys in Cooperland" is told as a trip through the magic city of stainless alloys as taken by the Walrus of Alice in Wonderland. Illustrated in full color. 28 pages.	Cooper Alloy Foundry Co.
Heat Exchangers 206K	. . . get a picture of the proper design and installation of heat enchangers, pressure vessels and pipe for the oil refining, chemical and power industries. Vol. 1, No. 1 of a new house organ called "Alco Products Review." This issue includes an article on feedwater purification and picture stories of heat exchanger and pressure vessel installations. 12 pages.	American Locomotive Co.
Process Equipment 206L	. . . make weighing, batching and proportioning systems help you control your quality, costs, profits. Photographs show various units and how they fit into various industry installations. Diagrams show arrangement and operation. Specifications for various types of equipment. 56 pages.	Jeffrey Mfg. Co.
Process Equipment 206M	. . . supply your plant with its quota of such equipment as pulp refiners, attrition mills, crusher feeders, hammer mills, oil seed separators. Photographs and brief descriptions of a complete line of this type. 8 pages.	Bauer Bros. Co.

What's New In . . .	How to . . .	Company . . .
Instrumentation 207A	. . . design instruments and apply them in systems in the best possible way as well as to design processes in such a manner as to take full advantage of automatic control. An article on servomechanism techniques in modern system engineering. 24 pages.	Minneapolis-Honeywell Regulator Co.
Phythiocyanine Blue 207B	. . . make the broadest use of the new copper phthalocyanine blue pigment. A technical article covering suggested applications, properties, history. Curves, tables, photographs. 12 ages.	American Cyanamid Co.
Industrial Coatings 207C	. . . evaluate the products and servsolvent blends. An illustrated outline of retrial coatings, adhesives, thinner, cleaners and solvent blenpds. An illustrated outline of research and production facilities. 16 pages.	Pierce & Stevens Inc.
Sodium 207D	. . . Handle metallic sodium, from 1-lb. bricks to 80,000 lb. tank cars. Tables and illustrations cover methods of shipping, handling solid sodium, handling liquid sodium, cleaning process equipment, properties and commercial specifications. 24 pages.	National Distillers Chemical Corp.
Fungicides 207E	. . . prevent government rejection by keeping close chemical control of fungicide treating of fabrics and fibers. Four simple methods to determine the quantities of copper, zinc and mercury on treated materials. 15 pages.	Nuodex Products Co.
Cold Rubber 207F	. . . prevent scorching, aid dispersion, reduce power consumption during processing of cold rubber with new process aid known as Sundex-41. Physical properties. How to use and formulate under various processing conditions. 16 pages.	Sun Oil Co.
Ceramics 207G	. . . get a picture of what's available insteatite products such as tubing, coil forms, stand-offs, strains, assemblies, appliance parts, bushings. Drawings and dimensions. Chart shows 18 technical characteristics of 14 typical ceramic products. 52 pages.	Stupakoff Ceramic and Mfg. Co.
Instruments 207H	. . . measure and control flow, pressure and temperature from a long or short distance away. Operation and applications of this company's Chronoflo Telemeters which make possible the transmission of information and controls over a simple two-wire electrical circuit for unlimited distances. Diagrams and photographs. 8 pages.	Builders-Providence Inc.
Alloys 207I	. . . use aluminum bronze alloys in corrosion resistant service. Corrosion-erosion resistance and cavitation-pitting data along with physical and chemical properties of various alloys recommended for such service. Use of the alloys in centrifugal pumps, plug valves, pipe, tube. fittings, tube sheet. 20 pages.	Ampco Metal, Inc.
Lubricants 207J	. . . solve your hot bearing maintenance problems with silicone lubricants. An article on properties, applications and performance. 8 pages.	Dow Corning Corp.
Hammer Mills 207K	. . . crush, grind, granulate, pulverize or shred using this company's hammer principle. Illustrates how the type of hammers and shape and location of the breaker plates are changed in various pieces of equipment designed to suit each operation. Specifications charts cover the whole line. 24 pages.	Williams Patent Crusher and Pulverizer Co.
Instruments 207L	. . . choose and use pH and conductivity recorders and controllers. Fundamental operating principles, descriptions of measuring systems and details of components as well as numerous typical applications. 40 pages.	Minneapolis-Honeywell Regulator Co.
Pumps 207M	. . . pump practically any liquid, from heavy viscous liquids to light solvents, solids in suspension, abrasive slurries, hot or cold liquids, liquefied gases and other materials. Covers a standard line of motor-driven controlled volume pumps as well as models designed for special applications. Details on how pump capacity can be regulated by plunger speed and plunger stroke adjustments. Capacity pressure selection tables. 24 pages.	Milton Roy Co.
Condenser Tubes 207N	. . . apply and install condenser and heat exchanger tubes, also plates for tube sheets, heads and baffles. Operational factors affecting tube life; how to choose the proper material of construction from copper and a wide range of copper alloys; corrosion factors in condenser tube service. Tables give physical properties and performance data on the various types of equipment. 44 pages.	American Brass Co.
Pipe 207P	. . . select from a line of glass-lined pipe and fittings as well as glass-lined and alloy valves. Drawings show design features of each. Dimension charts. 12 pages.	Pfaudler Co.
Gages 207Q	. . . protect your boilers, deaerating tanks, boiler feed water heaters and storage with this company's remote reading liquid level gages. Photographs, operation and mounting diagrams. 8 pages.	Jerguson Gage & Valve Co.

THE
RIGHT
COMBINATION

Layne offers you the right combination of unmatched experience plus modern equipment for installing well water supply units of any size—and for any purpose. Layne has made more water supply installations than any other firm in the entire world, and this valuable experience places Layne in a position to unquestionably do every job exactly right. Once the installations have been made, a complete record of everything is kept; strata formation, sand porosity, casing details, sand screen length, diameter and metal used, all pump information including bearings, shafting, impellers and operating characteristics. With such information, Layne is always in a position to give quick and most economical service for adjustments or repairs if and when needed.

Everything by Layne

Layne accepts your contract for furnishing everything; Layne supervision, Layne drill crews, Layne drill equipment, Layne designed and Layne built louver type sand screen and Layne high efficiency vertical turbine pumps. No other firm is involved, therefore there is no divided responsibility. This plan gives you the very finest well water supply units that world wide experience and skill can build.

Layne offers a wide range of fully illustrated catalogs covering all phases of well water installations for all types of industry. Write for more information to

LAYNE & BOWLER, INC.

General Offices, Memphis 8, Tenn.

Layne
WATER SUPPLY
WELLS & PUMPS

SLY

Pioneers and Leaders in INDUSTRIAL DUST CONTROL

Sly Dust Filter used for the collection of fine, flocculent silica dust in a large southern California plant.

SLY will solve your Dust Problem

- Fifty years' experience with literally thousands of successful installations.

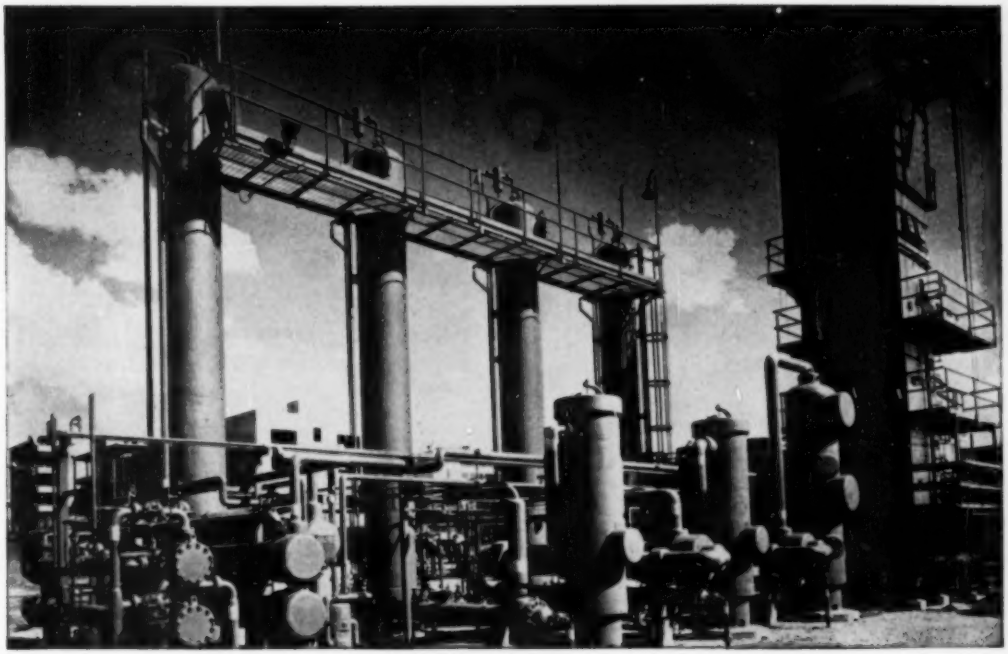
Sly Dust Filters are used on such difficult dust as powdered sugar, bentonite clay, paint and pigments, aspirin and other pharmaceuticals, chemicals of all kinds, talc, lime, detergents.

Sly Dust Filters are not expensive. A Sly engineer is near you to discuss your problem with you. Ask for Bulletin 98.

THE W. W. SLY MANUFACTURING CO.

New York, Chicago, Philadelphia, Detroit
Buffalo, Cincinnati, St. Louis, Minneapolis
Los Angeles, Toronto

What's New In . . .	How To . . .	Company . . .
Valves 208A	. . . conserve valuable products which would otherwise be lost through vaporization. This company's combination pressure-vacuum vent valves also prevent the accumulation of excessive pressure, and, when used in combination with the flame arrester bank, prevent propagation of flame into the vapor phase of any container if the vapors so vented are flammable and become ignited. Photographs and cross-section drawings. Includes 14 relieving capacity charts, one fo reach valve size. 22 pages.	Black, Sivalls & Bryson, Inc.
Fans 208B	. . . furnish your boiler installations with forced draft fans. Various models are pictured. Performance and general characteristics are described. 8 pages.	Thermix Corp.
Alloys 208C	. . . distinguish between copper base alloys. Lists 65 commonly used Bridgeport brass and copper alloys, along with their composition, properties, forms and typical uses. 4 pages.	Bridgeport Brass Co.
Instruments 208D	. . . take advantage of the flow meter calibration service offered to industry by this company's hydraulics laboratory. Describes laboratory facilities and calibration methods used. 8 pages.	Fisher & Porter Co.
Pumps 208E	. . . handle chhemicals, liquors, corrosive materials and solutions, hot liquids and petroleum with an oil-lubricated bearing, pedestal-mounted pump. Six alternate sealing arrangements are shown and dimensions and specifications of the pump (available in capacities to 1200 gpm. at heads to 250 ft. and temperatures to 500 deg. F.) are given. 6 pages.	Allis-Chalmers Mfg. Co.
Chemicals 208F	. . . select any of this company's coal chemicals, plasticizers, activated carbons, protective coatings, agricultural chemicals. Charts break the information down into product, description, uses. 12 pages.	Pittsburgh Coke & Chemical Co.
Instruments 208G	. . . outfit your plant's control room with instruments operating on the pneumatic force-balance system. Photographs show a new look in control rooms; panels are set up to show a simplified flow diagram of the plant—its process units, main connecting lines and control valves. Flows, temperatures, levels and pressures are shown at their corresponding locations. Includes large, color-keyed operating diagrams of the instruments. Chart summarizes performance data on each instrument. 16 pages.	Moore Products Co.
Instruments 208H	. . . simplify the task of measuring flow rate and quantity with electromagnetic flowmeters. Construction and operation. 8 pages.	Century America Corp.
Solvents 208I	. . . satify your solvent requirements from a complete line of industrial hydrocarbon solvents. Charts give applications and properties. Curves show comparative evaporation rates of petroleum solvents. 8 pages.	American Mineral Spirits Co.
Coatings 208J	. . . protect metal surfaces exposed to corrosion, tuberculation and incrustation. Covers hot application enamels, primers and coupling compounds, cold application enamels, bituminous paints. Properties, uses, containers, performance tests and application procedure for coatings; handling storage and inspection of protected surfaces. 24 pages.	Reilly Tar and Chemical Corp.
Reagents 208K	. . . stock your laboratory with your choice of more than 1,000 high purity chemicals. Grades, strengths, maximum limits of impurities on all of them. One section deals with storage and handling of troublesome chemicals. 264 pages.	Baker & Adamson Products
Scrubbers 208L	. . . clean, cool or absorb gases. Cross-section diagram shows operating principle. Capacity curve sheet, photographs showing typical installations. 6 pages.	Peabody Engineering Corp.
Materials Handling 208M	. . . save time, money and manpower with electric fork trucks. Various models, their special features and applications are shown. Chart gives specifications and performance data for the line. 12 pages.	Yale & Towne Mfg. Co.
Safety Clothing 208N	. . . cut down replacement cost on work clothes. New Dynel clothes are said to resist acids, caustics, wear, moths, mildew, shrinkage, snagging and tearing. Photographs show types of clothing available. 4 pages.	Mine Safety Appliances Co.
Pumps 208P	. . . insure long lift and trouble-free operation by choosing one of this company's grease-lubricated pedestal-mounted general purpose pumps. Large cutaway drawing shows basic construction of the pump, type 8SH. Accessories and construction materials to suit various applications are discussed. 6 pages.	Allis-Chalmers Mfg. Co.
Instruments 208Q	. . . dispense industrial and biological fluids of all types including sterile solutions. Specifications and technical data on a line of metering pumps. Fixed or variable speed transmission pumps of a wide variety of output capacities are listed. 16 pages.	Mechanical Products Corp.



HYDROGEN... pure and low cost for Lever Brothers Company at Los Angeles

FOR THEIR NEW Los Angeles plant, Lever has again installed a Girdler HYGIRTOL* plant to assure a dependable source of high-purity hydrogen for hydrogenation of vegetable oils used in Lever products. This plant, shown above, is the second Girdler hydrogen plant purchased by Lever Brothers Co.

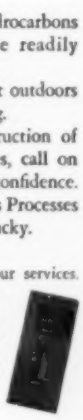
Hydrogen purity with this process generally exceeds 99.8%. Instruments control the plant, which is practically automatic. Just one man is needed to supervise operation and to maintain hydrogen production at the desired rate.

Process material costs, as well as labor costs, are low. HYGIRTOL plants use natural gas, propane or butane for process materials. These hydrocarbons are reasonable in cost, are readily available and easy to handle.

HYGIRTOL plants are built outdoors to save the cost of a building.

For planning and construction of *your* gas processing facilities, call on Girdler. You can do so with confidence. The Girdler Corporation, Gas Processes Division, Louisville 1, Kentucky.

Write for bulletin describing our services. The Girdler Corporation designs and builds plants for the production, purification, or utilization of chemical process gases; the purification of liquid or gaseous hydrocarbons; the manufacture of organic compounds.



Entrance to Lever Brothers Company new Los Angeles plant reflects modern design of all facilities and equipment. This plant will supply a variety of soap and shortening products to Western market areas.

*Hygirtol is a trade mark of The Girdler Corporation

GIRDLER

Packaged TCC Unit

Costs are cut by shop fabrication, standardization, pre-engineering, and derrick structure for catalytic section.

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

In late 1949 the Southwestern Engineering Co. became interested in packaged Thermofor Catalytic Cracking (TCC) units for the independent refiner operating a refinery of less than 12,000 bbl. per stream day crude oil capacity. Working closely with the Socony-Vacuum Oil Co., which invented and developed the TCC unit, Sweco engineered a complete packaged plant including feed preparation, catalytic cracking section, fractionation, gas plant and catalytic polymerization. It was built for the New Mexico Asphalt & Refining Co., Artesia, N. M.

Costs are kept at a minimum by such expedients as the use of shop fabrication, standardization of flowsheets, pre-engineering of a large percentage of the plant and a standard plot plan which could be modified slightly for particular conditions according to W. O. Jacobs of Sweco. Another major cost cutting feature is an oil well derrick type structure for the catalytic section.

In addition to the TCC unit, Sweco also designed and erected a new liquid phosphoric acid catalytic polymerization unit developed by Standard Oil Co. of California and licensed by Hydrocarbon Research, Inc. The unique feature of this process is the utilization of commercial liquid phosphoric acid catalyst. A bed of quartz chips is filled with phosphoric acid and then drained, leaving a film of catalyst deposited on the quartz. In this manner the handling of high cost impregnated catalyst is eliminated. On-stream time compares favorably with that of older solid catalyst processes.

The TCC feed preparation section is arranged to permit either hot or cold gas oil, topped crude or whole crude charge. Products from the fractionation section can be heat exchanged for maximum economy where thermal cracking is not utilized, or the heavy catalytic cycle oils can be charged directly to a thermal cracker. A vacuum unit can be added to the feed preparation section for preparation of heavy gas oil which is charged as liquid to the TCC reactor. The newly-developed units are designed to handle a combination vapor and liquid feed. The vacuum unit receives its charge directly from the TCC feed preparation atmospheric flasher. Operating temperature of this unit is such that additional heat for vacuum flashing is ordinarily not necessary.

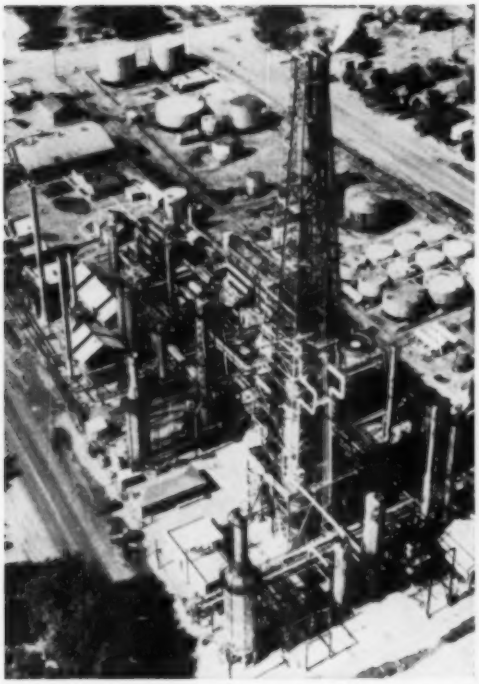
The unit at Artesia has a nominal fresh feed capacity of 6,000 bbl. per stream day of gas oil, operating at approximately 55 percent conversion level. The catalyst regenerator consists of two identical kilns, each with a carbon burning capacity of 1,650 lb. per hr. The double kiln arrangement was desirable from the standpoint of flexibility

Over-all
cracking

of oper
whereas
fabrica
means
former

Air
at 950
top int
catalys
shell a
side, t

The
structu
stallati
minim
by hea
job sit
entire
–flexib
dles ar
the ex
to faci
equipp
dismar
contro
system
menta
things
diate
Proces
panel
cate p

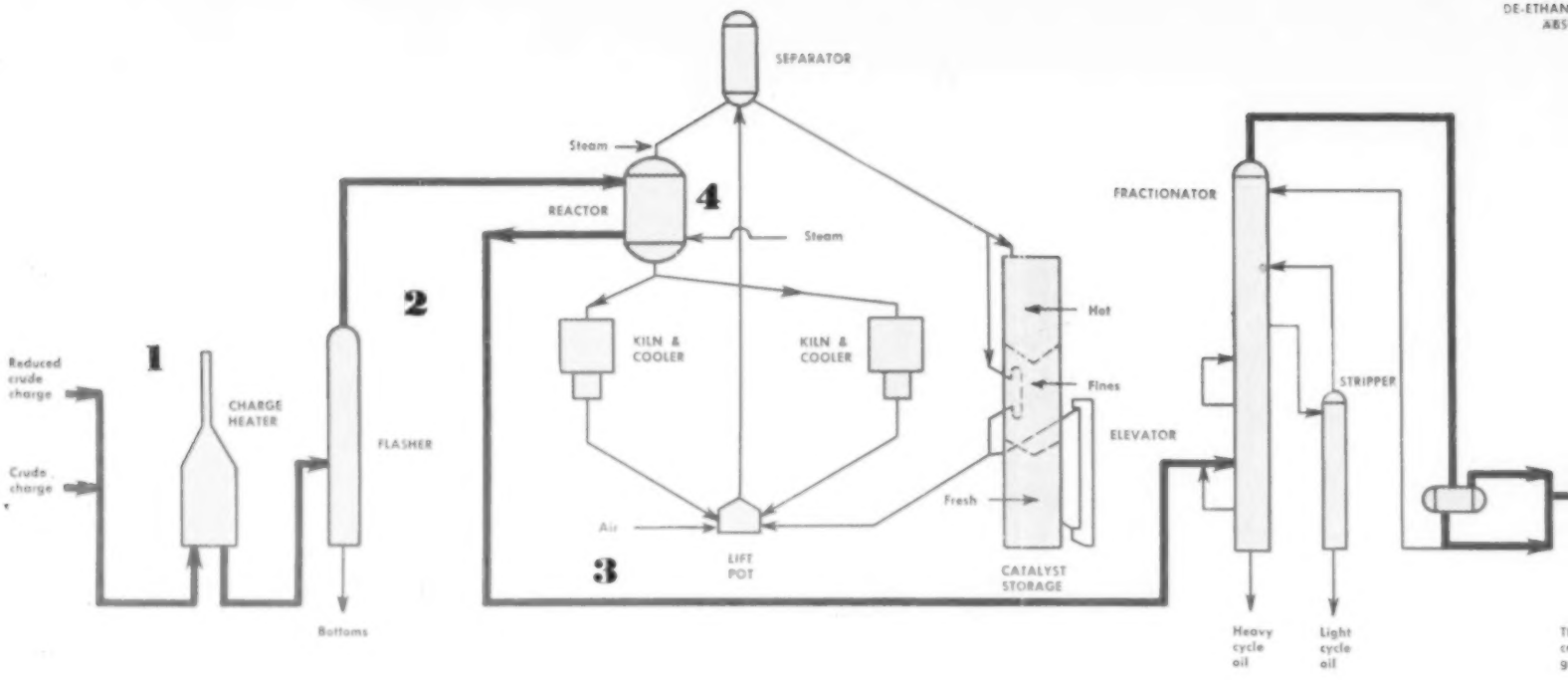


Over-all view of packaged TCC plant including feed prep, cat cracking, fractionation, gas plant and cat polymerization.

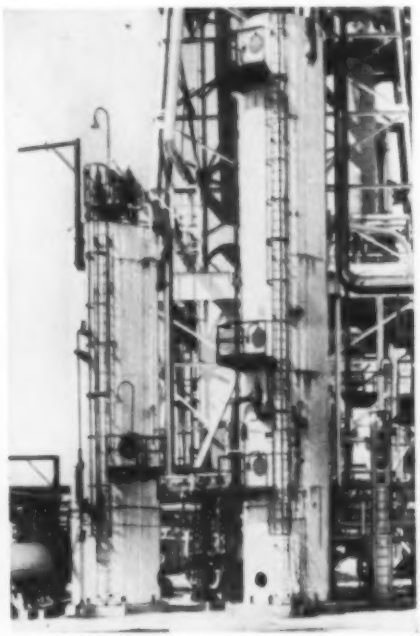
of operation. It also permitted complete shop fabrication, whereas a single kiln would have involved high cost field fabrication. Catalyst is conveyed through the unit by means of an air lift system which replaces the elevators formerly used.

Air at 3½ psi. is introduced into the lift pot. Catalyst at 950 deg. F. flows by gravity from the separator at the top into the reactor, which operates at 10 psi. Regenerated catalyst leaves the kilns at 1,250 deg. F. and flows to a shell and tube cooler where steam is generated on the cold side, reducing the catalyst temperature to 1,000 deg. F.

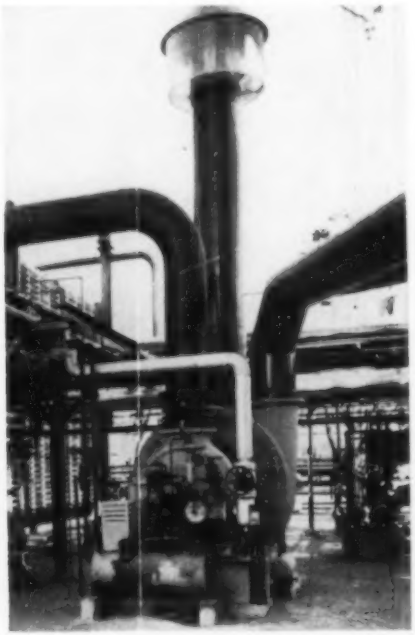
The catalytic section features an oil well derrick type structure. The derrick is completely erected prior to installation of vessels. Rigging costs are thereby kept at a minimum since the derrick serves the role ordinarily played by heavy rigging equipment which must be erected at the job site and dismantled on completion. Design of the entire plant is governed by two predominant considerations —flexibility and economy of operation. Exchanger bundles are kept small for ease of removal and structures over the exchanger banks are permanently installed with trolleys to facilitate maintenance. The compressor house is also equipped with a U-shaped trolley to permit the rapid dismantling and replacement of compressor parts. The control room features a semi-graphic control panel with a system of alarms to call attention to process upsets. Instrumentation of the catalytic section is so designed that such things as power failure and major upsets will cause immediate bypassing of the unit and automatic shutdown. Process flow is schematically diagramed on the control panel and a color code system employed to quickly indicate process lines and control points.



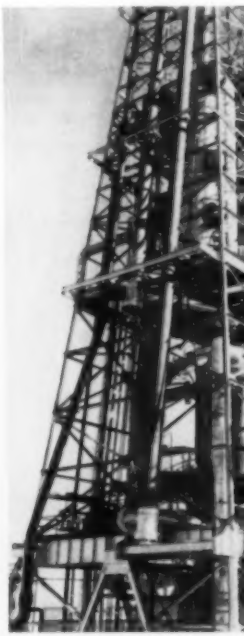
1 Feed prep heater and exchangers. Structure over exchanger bank is for removal of bundles.



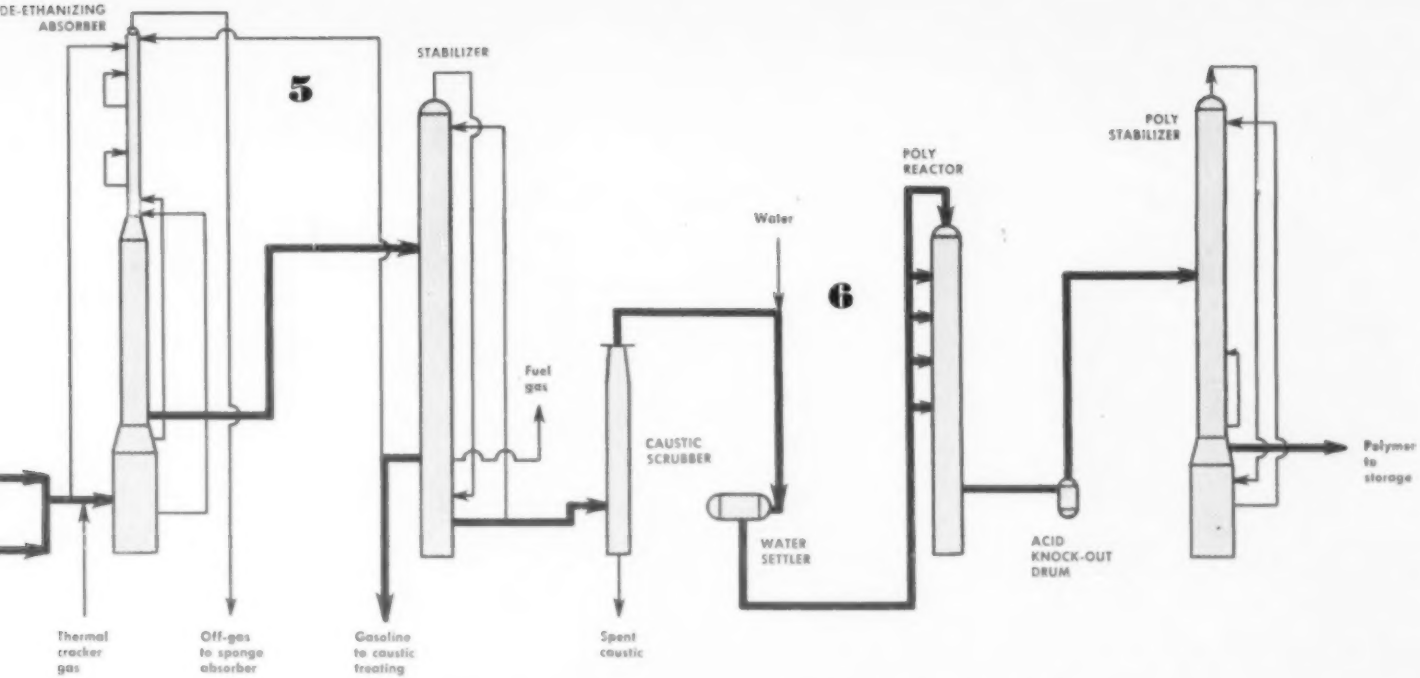
2 Atmospheric flasher (left) for reactor feed and fractionator (right) for reactor effluent.

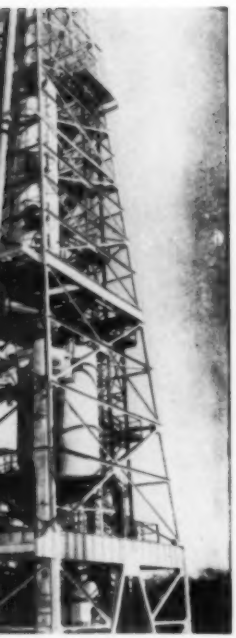


3 Turbine driven blower with condensing vacuum system for catalyst lift and combustion air.

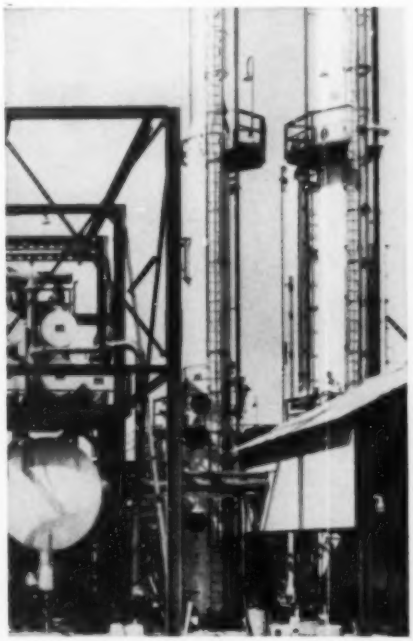


4 Catalytic section showing kiln for burning off carbo

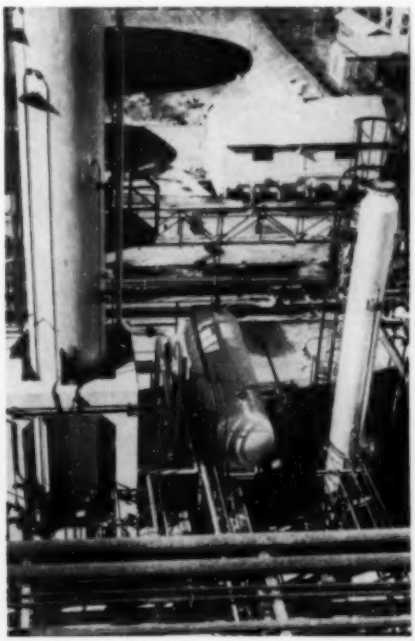




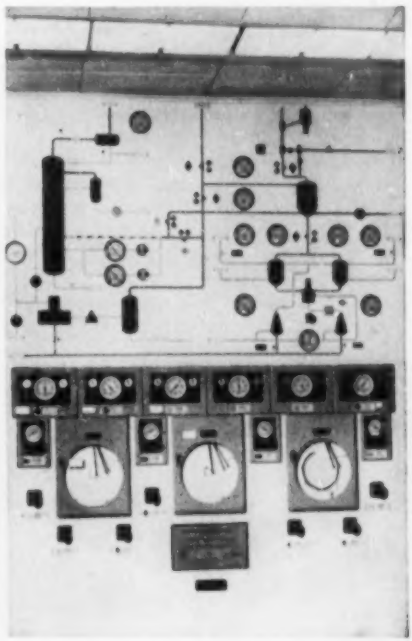
showing reactor and double off carbon from catalyst.



5 De-ethanizing absorber and stabilizer. Condenser bank structure is for removal of bundles.



6 Poly reactor (left) and caustic scrubber (right) with wash water settler in the middle.



Semi-graphic control panel with alarms. Power failure and major upsets will cause automatic shutdown.

Infinitely Variable Speed

MEANS MORE EFFICIENT PROCESSING

Do you process materials which require centrifuging at different speeds? Or do you have several products with different filtering and washing characteristics to be processed in the same centrifugal? If so, Tolhurst Suspended Centrifugals with infinitely variable speed hydraulic drive provide the most efficient answer. By simply turning the hand wheel on the fluid drive unit, you can select exactly the speed you want for each different operation. Tachometer indicates basket speed at all times.

YOUR CHOICE OF MATERIALS

BASKETS — Perforate or imperforate, constructed of steel, steel rubber-covered, stainless steel, monel or other materials.

CASE — Steel case can be lined with stainless steel, monel, rubber or other materials.

RACK AND PLOW OF COUNTERBALANCED UNLOADER—Steel, stainless steel, monel or bronze.

ACCESSORIES — Machine can be furnished with fume-tight cover, feed and spray pipes.

BASKET SIZES AND SPEEDS	
20" diameter	0-2500 RPM
26" diameter	0-2500 RPM
32" diameter	0-1500 RPM
40" diameter	0-1500 RPM
48" diameter	0- 900 RPM

WRITE FOR DETAILS AND PRICES

Tolhurst

CENTRIFUGALS DIVISION
AMERICAN MACHINE AND METALS, INC.
EAST MOLINE, ILLINOIS

piping maintenance *costs more* now!

No. 485½ Iron Body Cla

CRANE CO

VALVES • FITTINGS • PIPE •

nce

You spend less on it
by using Dependable Quality

CRANE VALVES

. . . That's why more Crane Valves are used than any other make

easy to open for inspection

It's no trick to dismantle this clamp gate valve for inspection, cleaning, or servicing. Just remove two nuts and lift out the complete bonnet and disc assembly. The body stays in the line. Reassembling is just as easy. Repeated opening does not affect bonnet joint tightness or alignment.

A real time and labor saver on lines needing periodic cleanout, Crane Outside Screw and Yoke Clamp Gates are made in materials suited to a variety of services. Also Inside Screw with rising stem and Quick-Opening Patterns. Choice of flanged or screwed ends.

For complete valve suitability at lower ultimate cost, you're better off with Crane Valves. Ask your Crane Representative for demonstration.

n Body Clamp Gate

CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

PE • PLUMBING • HEATING

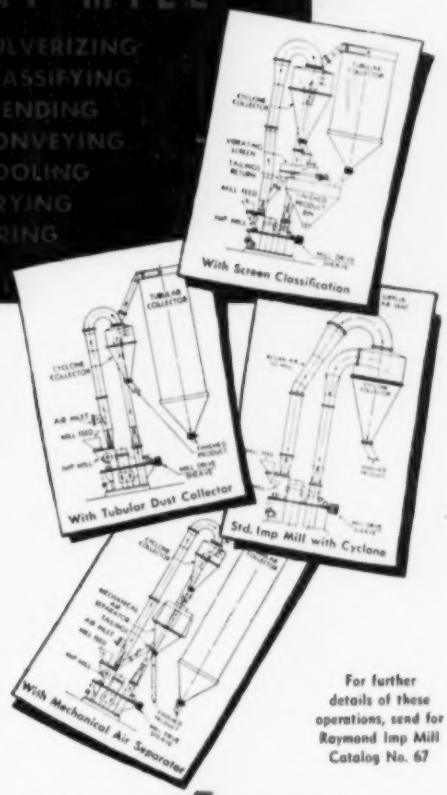
The Answer

to hundreds of GRINDING PROBLEMS

RAYMOND IMP MILL

- PULVERIZING
- CLASSIFYING
- BLENDING
- CONVEYING
- COOLING
- DRYING
- FIRING

RAYMOND STANDARD IMP MILL



The Raymond Imp Mill may be variously equipped, as shown in the diagrams, for handling the many special pulverizing operations in the chemical and food industries.

Such special applications as producing soya bean flour from solvent flake . . . pulverizing phosphate chemicals to high finenesses . . . removing "water of crystallization" from hydrate compounds . . . are typical of the adaptability of the Imp Mill.

Refer your problem to Raymond engineers. They can tell you if the Imp Mill with its clean, automatic, dustless system will fit your job.

For further details of these operations, send for Raymond Imp Mill Catalog No. 67

COMBUSTION ENGINEERING-SUPERHEATER, INC.

1311 North Branch St.
Chicago 22, Illinois

Raymond
PULVERIZER DIVISION

Sales Offices in Principal Cities

DIGESTER for pressure cooking during furfural manufacture.

Why the Furfural Freshe

It springs from defense needs, r improved processes, stable price and, abo markets. There's nothing corny about it

Outbreak of war in Korea brought a sudden demand for furfural for synthetic rubber, nylon and other defense uses. As a result, stepping up production became the big immediate job and a whole rash of new furfural developments had to be temporarily shelved.

With synthetic rubber so vital to defense, more and more furfural has been ending up as working inventory at butadiene plants. An added pinch came when Du Pont completed a doubling of capacity at its Niagara Falls nylon plant ahead of schedule. The final straw was the loss of furfural in the recent fire at the Borger, Tex., butadiene plant of Phillips Chemical Co. However, NPA eased the pinch by temporarily lowering inventory levels. Meantime, new capacity was being built.

Now that the big new plant of Quaker Oats Co. at Omaha, Neb., is turning out furfural at a 40 million pound a year clip, bringing the nation's total capacity close to 100 million pounds a year, the new developments are being dusted off again and given a good hard look. Among them: tapping of new raw material sources and production by an entirely new process.

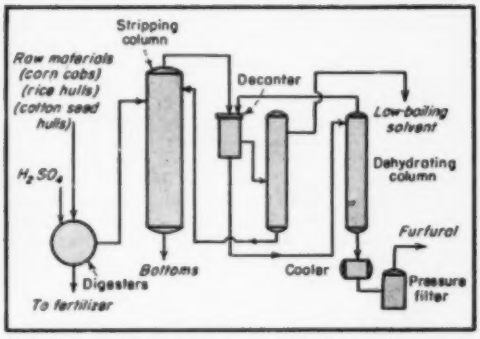
▶ **Where It Comes From**—Corn cobs are the leading raw material today, but weren't even in the picture until 1942. Collecting and handling of the thousands of tons are prime factors f tion, weren't develo 1942.

Raw material so pend on the agricul around the plant. Memphis plant us rice hulls, Cedar Ra and Omaha, natura of all. New raw m looked at now be all of the potenti jack up demand ev high capacity. If more capacity may you can expect to new production pr Quaker prefers at coyly mum.

▶ **How Uses Stack** biggest use for fu chemical intermedia onitrile for nylon— use of all. But it h Synthetic resins we until 1936, when took the lead. Lu to synthetic rubbe ing the 1941-42 s demand; permaner ates in 1948.

Chemical interm tined to remain on as though there'll b around for ranking near future. Toda

facture.



PROCESS used by Quaker to get furfural from farm wastes.

eshet?

eds, new capacity, d, above all, new ut it but the cobs.

of tons of raw materials factors for a stable opera- 't developed for corn until

terial sources usually de- e agriculture of the region e plant. Thus, Quaker's plant uses cottonseed and Cedar Rapids uses oat hulls , naturally, is the corniest w raw materials are being now because any one or potential new uses may mand even beyond present ity. If that happens, still ity may be needed. Then xpect to hear about that ction process, about which fers at present to remain

s Stack Up—What's the for furfural? Today it's termediates, including adip- nylon—the biggest single But it hasn't always been. esins were tops from 1922 when lube oil upgrading ad. Lube oil surrendered e rubber temporarily dur- 41-42 surge in butadiene ermanently to intermedi- 8.

l intermediates seem des- nain on top, but it looks here'll be a lot of shuffling ranking honors in the very . Today, in order of decreasing tonnage, the principal end uses are: (1) chemical intermediates; (2) lube oil upgrading; (3) synthetic resins; (4) furfuryl alcohol; (5) synthetic rubber; and (6) resin-bonded grinding wheels.

▶ **Upcoming Uses**—One of the newest uses for furfural is in the refining of gas oils and removal of catalyst-poisoning sulphur compounds from cat cracker stock. Texas Co. developed the process at its Westville, N. J., plant, already has two licensees and still others nibbling. This use may soon vie with lube oil upgrading for second place.

Lube oil upgrading (furfural extraction of aromatics), an older use, continues to grow. Foreign furfural production isn't high enough to provide initial charges for processing plants, can only supply enough to keep them replenished. Consequently, many new plants will require charges of 100,000 to 1 million pounds this year. These include Societe Generale Huiles de Petrolios (Dunkerque, France), Compagnie Francais de Raffinage (Gonfreville, France), Anglo-Iranian Oil Co. (Llandarcy, England), plants in Italy, Japan and the West Indies. Others, scheduled for completion in 1953, also will want furfural.

Furfural's high selectivity for aromatics points up its use for their recovery. Three companies are now at work on recovery of aromatics, with projects in stages ranging from research laboratory to pilot plant.

A new plant for decolorizing wood rosin has just been completed by Dixie Pine Products at Hattiesburg, Miss. Hercules Powder Co. has also long been active in this field. Fur-

fural removes latent color bodies that would darken rosin upon heating, thus helps to make wood rosin competitive with gum rosin.

Larger plastic moldings for TV cabinets and other articles are in high demand today. Furfural gives better flow characteristics to resins for large molds than the faster-curing formaldehyde resins.

▶ **Derivatives Active**—Quaker makes six derivatives, four in commercial quantities. Twelve other companies buy furfural, make derivatives in commercial and pilot-plant quantities in numbers from one to the hundreds made by Eaton Laboratories.

Du Pont converts furfural to nylon through a chain of reactions involving furan, tetrahydrofuran, dichlorobutane and adiponitrile, sells the intermediates as well as the nylon, and comes out the biggest user of furfural.

Furfuryl alcohol, already fourth largest in the end use list (but at the same time still considered an intermediate), is the base of a thermosetting resin cement that can be used with acid brick in linings for digesters and tanks. Setting at room temperature, it has good corrosion resistance. Reinforced with glass fiber, it has also been used to fabricate pipes and ducts, as well as armor for stoneware pipe. When filled with asbestos, it forms the familiar cast molded equipment Haveg 60.

If demand for furfuryl alcohol rises enough to require added capacity, a new continuous process has just been developed, will probably be used for expanding production. At present, a batchwise hydrogenation in the presence of copper chromite catalyst is used.

Tetrahydrofurfuryl alcohol is blossoming out in new uses. Pittsburgh Coke & Chemical Co. is starting to market an ester of the alcohol with 2,4-D and 2,4,5-T for use as a low-volatility brush killer. Pittsburgh, Emery Industries, Inc., and Arnold Hoffman & Co., Inc., make an oleate ester of the alcohol that's used as a secondary plasticizer for vinyl plastics. Lysine, an essential amino acid, is made from the alcohol in a Du Pont pilot plant.

Pharmaceuticals are a new field for furfural. Eaton Laboratories, Inc., manufactures 5-nitrofurfural semicarbazone for antibacterial use, sells some as a solution, some as soluble dressings. Most of the output, however, goes to Dr. Hess & Clark Laboratories at Ashland, Ohio, where it's packaged as "NFZ" and sold as a treatment for coccidiosis, a poultry disease.

Oddly enough, Quaker buys from a customer's customer. Quaker sells furfural to Eaton, buys "NFZ" from Dr. Hess & Clark Laboratories for use in its own poultry feeds. Use of a pound of the derivative per 9 lb. of feed points up a potentially large market here, plus possibilities for hog use.

▶ **Residues Too**—One of the residues of furfural production is a Duke's mixture of methanol, esters and low-boiling aldehydes and acetals. It results from side reactions in the process. Quaker markets it at 8 c. a gal. for use as a solvent, solvent extender and coupling agent.

The solid residue (corn cobs minus furfural) finds other uses than as a fertilizer conditioner now. Smoother castings result if a small amount is mixed with foundry sand. By burning out, the residue leaves room for sand expansion, prevents pitting.

Quaker is also beginning to push a finely ground grade to the Northwest plywood industry as an extender for phenolic resin glues. It costs no more than walnut or bark shell flour.

▶ **How It's Made**—Quaker has come up with a few improvements in the manufacturing process, but it keeps these secret. Otherwise, the process is still basically the same. Biggest factors in making furfural are large volume production, maximum efficiency in collecting and handling the thousands of tons of raw materials, and development of profitable markets for residues.

Corn cobs are the No. 1 raw material, and are used at all three of Quaker's plants. But cottonseed and rice hulls, as well as oat hulls, are also used.

Whatever the raw material, it's mixed with dilute sulphuric acid and charged into a large spherical rotary digester. Pentosans in the material hydrolyze to pentoses under 70 psi. steam, and then split out water to form furfural. Side reactions form acetic acid, methanol and other compounds that must be removed from the furfural by distillation.

Digester vapors are condensed, followed by azeotropic distillation of furfural. Condensation of the distillate results in two layers—furfural and water. The water layer is decanted and distilled to recover methanol. The furfural layer is run through a dehydrating column, cooled, pressure-filtered and enters storage as 99.5 percent plus pure furfural.

Solid residues from the digester are flash-dried and pulverized for sale. Alternatively, residues can be used to fuel the plant's boiler, helping to provide the 16-26 lb. of steam required for each pound of furfural.

▶ **Stable Price**—One of the best reasons for the growing and diversified demand for furfural is its long record of stable price. Its price was 9 c. a lb. in the '30s, was edged up 1 c. last June, is currently only 10½ c. a lb. This goes far toward explaining why phenol (which has climbed from 9 c. to 17½ c. in the same period) plays second fiddle to furfural in lube oil upgrading processes.

LITTLE BONER

The Backward Pump

"Won't you come over and help us get an ornery pump running right. I'm going nuts; we can't play around with people's health, you know, in treating water."

The water works supervisor was excited. It was Saturday afternoon and the beginning of a long weekend. He had finally located a consulting chemical engineer in the small Pennsylvania town.

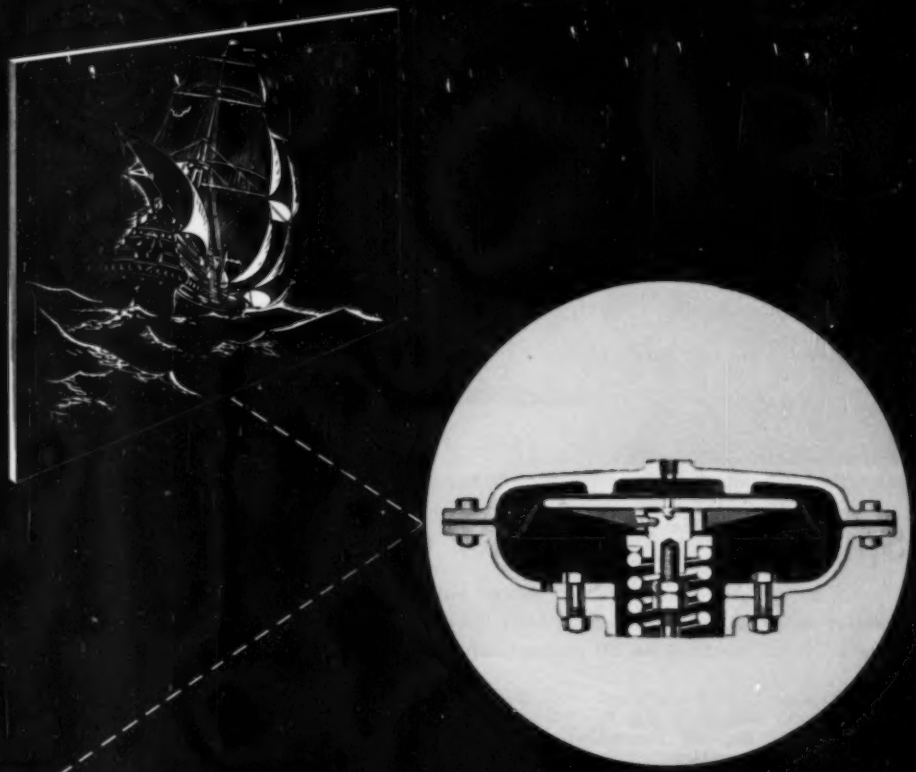
"Guess you're the only engineer still in town," he said. "We've just put in a new pump and the thing won't work up enough pressure to force the chlorine into the water main. Another pump's working, but I'm afraid it won't be enough for the long weekend. I'm new on the job, and worried."

The chemical engineer stopped painting his back porch and drove over to the town's water treating works.

He was met by the supervisor and led to the chlorinator with the ailing centrifugal pump.

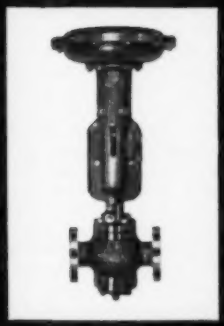
It was running backward!

We picked up this little boner from a well-known consulting organization. If you pick up a true "Little Boner," why not pass it along? Address the Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.



ROLLING ACTION . . .

for superior spring-diaphragm characteristics



The pre-moulded neoprene diaphragm in the Honeywell Series 700 Valve features rolling action . . . eliminates wrinkling or buckling . . . responds to slightest change in signal air pressure . . . may be used with either air or gas as actuating medium. The Honeywell Series 700 Valve is available in a wide range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-3.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Ave., Philadelphia 44, Pa.

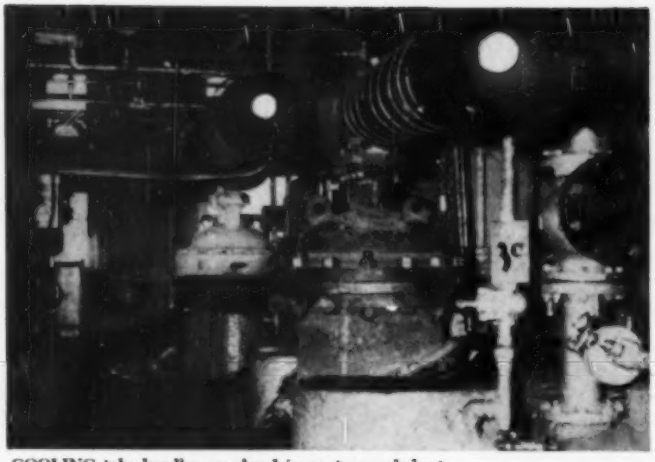
MINNEAPOLIS

Honeywell

VALVE PRODUCTS

First in Controls

H HONEYWELL



COOLING tube bundles are placed in reactor manholes to . . .

Speed Up Cold Rubber Output

A simple new cooling setup cuts cold rubber reaction to 11 hours, jacks up capacity 20 percent. Phillips' aim: a 7-hour reaction, an 80 percent capacity hike.

The sharp trend toward cold rubber –the copolymer made at 41 deg. F. instead of 117 deg.–has focussed attention on one big problem:

How can the cold polymerization reaction be speeded up so as to increase the capacity of the present jacket-cooled reactors that were designed for hot polymerization?

Although the reaction rate at 41 deg. has been stepped up to about 250 times what once was expected, it's still not high enough to suit RFC and the operators of its copolymer plants. Meanwhile, the demand for high-quality cold rubber keeps going up.

▶**Setup That Does It**–Now Phillips Chemical Co., a major contributor in developing cold rubber (*Chem. Eng.*, Nov. 1951, p. 145), has come forth with what looks like the best answer yet: a simple tube bundle for auxiliary cooling in the reactors.

The new technique has been tried out at the Phillips-operated RFC plant at Borger, Tex. The Borger unit is now turning out synthetic rubber at the rate of about 60,000 long tons yearly.

One typical recipe now being used at Borger has an average reaction time of 13 hr. per batch. The minimum at the specification temperature is 12 hours; this is set by the 250 sq. ft. of available heat transfer surface in the cooling jacket of the standard reactors.

The Phillips tube bundle, by providing an extra 100 sq. ft. of heat transfer surface, has cut this average reaction time to 11 hours, thereby increasing the reactor capacity close to 20 percent. In addition, 7-hour reactions can be handled by the cooling arrangement; this increases capacity by some 80 percent. Phillips has even run a few batches in six hours.

Meanwhile, Phillips engineers continue their development work in the laboratory and pilot plant as well as at the Borger commercial unit. Their object is to get faster reactions so that the auxiliary tube bundles can be used at or near capacity.

▶**How Tube Bundle Works**–Phillips' first tube bundle for auxiliary cooling in the 41 deg. reactors was made of 0.75 in., 16 BWG, type 316 stainless steel. It has 30 hairpin-shaped tubes with an average length of 22 ft.

The entire bundle, about 10 ft. long, has a total cooling surface of 130 sq. ft. But only 100 sq. ft. is effective when a batch reactor is 90 percent loaded. Its total displacement is about 20 gal.–negligible in the standard 3,950-gal. plant reactors.

The cooler is placed vertically in the 18-in. manhole of the reactor (see cut). The coolant used in it is tapped from the refrigerated alcohol-water mixture that feeds into the reactor cooling jacket. A temperature control recorder regulates the flow.

For polymerizations carried out at 41 deg. F., the coolant enters at about 0 deg. and leaves at about 10 deg. The heat of reaction is approximately 540 Btu. per pound of polymerized product. In addition, heat from stirring, pumping and insulation leaks must be removed.

▶**Two Questions**–One of the questions yet to be answered is this: How much can the Phillips' tube bundles cut down the reaction time in continuously charged reactors in series? Most of the work to date has been done with batch reactors.

In addition, company engineers believe that the tube bundles can also be used to remove heat from high-temperature (117 deg. F.) reactions at faster than normal rates. This is the temperature now being used in the continuous hot GR-S polymerizations.

Yet one thing is now clear from the development work that has already been done on auxiliary cooling: the nation's capacity of cold rubber can be substantially increased by a relatively simple and cheap modification of the present polymerization reactors.

Hooker Uses Own Product To Clean Used Equipment

For the past year Hooker Electrochemical Co. was their own best customer, and a happy one at that.

During that time the company used its own cleaning agent, Virgo Molten Cleaner, to salvage much used and corroded equipment. Last month it announced saving $20,000 worth of cast iron and steel flanges, nickel pipe, fittings and chemical equipment.

Cost of the operation was $3,000, which makes a nice savings. But more important was the savings in metal and parts. Some of the restored pieces were irreplaceable. And by returning scrap nickel to an equipment manufacturer, Hooker was able to get unobtainable nickel pump parts.

Process used is also Hooker's. It consists of metal immersion in a molten salt bath at 850 deg. F., a water quench tank and an acid dip tank. Unlike conventional acid pickling operations, the Virgo cleaner does not attack the base metals of the parts cleaned.

Unlike conventional methods of steaming, brushing and scraping, the process saves considerable time. In the repair department, six pumps, a nickel cooling coil, and a large fan wheel were thoroughly cleaned in 6 man-hours of time. Usual cleaning time: 32 man-hours.

Projects... precision packaged for Industry!

More than a third of a century spent solving engineering and construction problems in the Southwest for the biggest names in industry has brought Brown & Root experience that can be invaluable to you.

Regardless of the nature of your project, be it a petroleum plant, chemical plant or public utility, Brown & Root can deliver a turnkey job. From advice on plant location, through flow sheets, design, procurement and construction, Brown & Root will do it better, faster and more economically.

If your firm contemplates construction or expansion in the Southwest or anywhere else, a call from you will put Brown & Root plant-planning experts at your disposal.

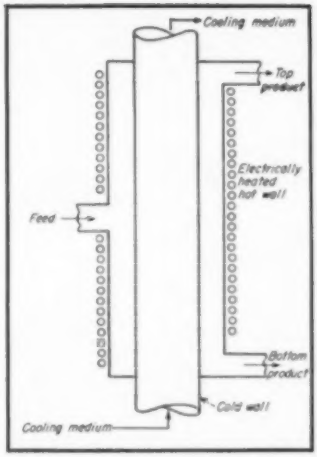
BROWN & ROOT, Inc. *Engineers • Constructors*

P. O. BOX 3, HOUSTON 1, TEXAS

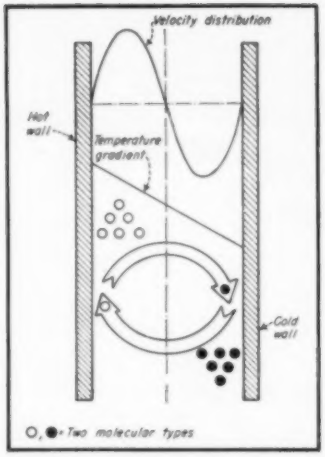
CABLE ADDRESS — BROWNBILT

BROWN-BILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.



Continuous column has concentric tubes with hot and cold walls close together.



Separation: some molecules move to hot wall and up, others to cold and down.

New Way to Separate Liquids

Liquid thermal diffusion, defying mass theory, separates liquids of same molecular weight or identical boiling point. It may become as important as distillation.

Mixtures of hydrocarbons have been successfully separated by liquid thermal diffusion in a specially designed continuous column in the Cleveland research laboratory of Standard Oil Co. of Ohio. The method, developed by A. Letcher Jones and E. C. Hughes, can also be used to separate mixtures of other compounds, both organic and inorganic.

In fact, liquid thermal diffusion may some day have as wide a range of applications as distillation has now. It's believed that certain separations can be carried out better by liquid thermal diffusion than by conventional methods. Sohio researchers wouldn't be surprised if the method found some commercial applications in the next two or three years.

What makes liquid thermal diffusion important is the fact that it provides a way to separate compounds having the same molecular weight or identical boiling points. Even isomers have been separated.

▶**Basic Idea**—In separating compounds by liquid thermal diffusion, the mixture is introduced into the narrow space between two smooth walls, one of which is heated, the other cooled. Because of the temperature gradient, there are more collisions between molecules near the hot wall than between those near the cold wall. Therefore, certain types of molecules move away from the hot wall and tend to concentrate near the cold wall; others concentrate near the hot wall.

In addition to the temperature gradient, convection currents are also set up in the mixture. These move molecules near the hot wall upward and those near the cold wall downward, thus effecting the separation.

Thermal diffusion isn't new. It's been used to separate the isotopes of chlorine in the gaseous state. And thermal diffusion in both the liquid and gaseous phases has been used successfully at Oak Ridge to separate the light and heavy uranium hexafluorides. But most applications have dealt with the gaseous phase. Little has been uncovered, up to now, about liquid thermal diffusion.

▶**Mass Not Decisive**—There's a vast difference between thermal diffusion in the liquid and gaseous states, however. For gases, the separation depends on mass differences. But for liquids, mass difference alone is not decisive. Apparently, other factors are also at work.

Liquid thermal diffusion can, in fact, separate components even where no mass difference exists. The three isomers of xylene, each of identical mass, have unmistakably been separated. The method is even more effective on the isomers of heptane. Triptane can be completely separated from *n*-heptane.

When it became apparent that liquid thermal diffusion could be used to separate compounds of the same molecular weight and hence had a wide range of possible applications, the Sohio researchers really got busy.

In the Cleveland laboratory, they tried thermal diffusion on a variety of organic liquids, both hydrocarbons and others. They delved into the obscure principles underlying liquid thermal diffusion. Armed with their new knowledge, they designed new apparatus, first for batch and then for continuous operation.

▶**Continuous Column**—After early experiments with batch columns, consisting of a rectifying section made from either parallel plates or concentric tubes with reservoirs at the top and bottom, Ohio Standard research workers were able to design a continuous column of improved design.

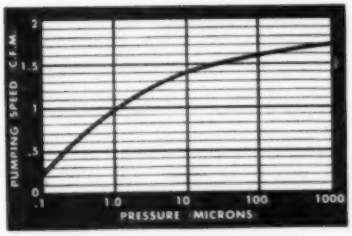
It consists of two concentric tubes, the inner one cooled and the outer one electrically heated. Feed enters the annular space between the two concentric tubes midway up the column. Products are continuously withdrawn at the top and bottom.

▶**Important Variables**—Height of the column is an important factor. It determines whether molecules concentrating near the cold wall have a chance to enter the downward stream. Taller columns are required for continuous operation than for batch operation. For a given withdrawal rate, all other conditions being constant, separation is approximately proportional to height. Effective separations have been carried out in columns from 5 to 40 ft. high. In the pilot plant at Cleveland, columns up to 60 ft. have been operated by Sohio researchers.

In batch operations, the narrower the spacing between the hot and cold walls, the better the separation. For a given height, the separation possible is an inverse fourth power function of the wall spacing. The time required for equilibrium is inversely proportional to approximately a seventh power function of the wall spacing. Hence very narrow spacing is not practical in continuous operation for reasonable rates of separation. Separation decreases very rapidly in narrow spaces with increasing rates, while wider spacing results in a much more gradual decrease. Hence the proper spacing for a given degree of separation depends on the rate of separation sought. The best spacing be-

THERE'S A LOT OF VACUUM IN THIS LITTLE PUMP!

Look at Kinney Vacuum Pump Model CVM 3153. It's small, yes — only about a foot high. It weighs only 70 lbs. complete with its ¼ HP motor.



Now take a look at its performance curve. See how it starts out with a free air displacement of 2 cu. ft. per min. See how large a percentage of its vacuum "pulling-power" is retained right down to the less-than-1 micron zone.

This is what you buy when you get a Kinney Model CVM 3153 — HIGH PUMPING SPEED. And this is why so many laboratories, so many production operations, so many vacuum service and test jobs are depending on this new Kinney Vacuum Pump. Send coupon for complete details and price. KINNEY MANUFACTURING CO., Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Philadelphia, Los Angeles, Houston, New Orleans, San Francisco, Seattle, and foreign countries.

Kinney VACUUM PUMPS

Kinney Manufacturing Co.
3551 Washington St., Boston 30, Mass.

Please send me Bulletin V51-A describing the new Kinney CVM 3153 Midget Vacuum Pump and price information.

Name .....

Company .....

Address .....

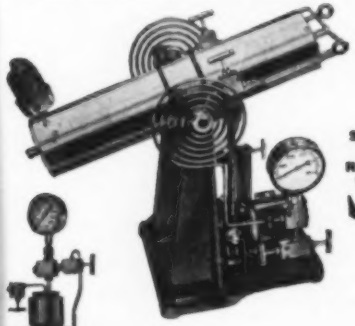
City ..... State .....

HIGH-PRESSURE
REACTION VESSELS

VARIOUS types, with or without shaking or stirring mechanisms, heating jackets, and removable corrosion-resistant liners.

Standard volumes, 43 ml. to 20 liters, for pressures up to 60,000 psi and temperatures up to 800° F.

Vessels for continuous reactions can be built for pressures up to 100,000 psi and temperatures up to 2500° F.



SHAKING TYPE REACTION VESSEL

STIRRING TYPE REACTION VESSEL

OTHER AMINCO SUPERPRESSURE PRODUCTS

- REACTION VESSELS
- VALVES • FITTINGS
- TUBING • PUMPS
- COMPRESSORS
- INSTRUMENTS
- DEAD-WEIGHT GAGES for pressures up to 100,000 psi.

30 YEARS EXPERIENCE
As pioneers – and still leaders, in the superpressure field, Aminco has an unmatched fund of experience which is at your disposal for the solution of your specific high-pressure problems.

Write for catalogue 406-Q.

AMINCO *Superpressure Division*
AMERICAN INSTRUMENT CO.
8010 GEORGIA AVENUE · SILVER SPRING, MARYLAND

tween hot and cold walls for practical height columns has been found experimentally to lie between 0.02 and 0.06 in.

In batch operations, neither the temperature level nor the temperature gradient affect the degree of separation obtained at equilibrium. But in continuous operations, both influence the separation at finite rates of withdrawal.

Higher temperature produces greater separation at a given rate of withdrawal. This probably results from the greater rate of thermal circulation at the higher temperature. The improved separation results from increasing the ratio of the rate of liquid thermal circulation to the rate of product withdrawal.

An increase in the thermal gradient increases the driving force that carries the particles across the space between the walls. This results in larger separations per unit time.

The liquid mixture being processed determines the principal limitations on temperature. Hot wall temperature should not exceed the boiling point or cracking temperature of the material, and the cold wall temperature should not be so low as to impede free flow. Low boiling materials may be separated by operating under pressure.

► **Other Factors**—Column height, wall spacing and temperature have been found to be the most important variables in the continuous process.

But there are other factors, which are less critical. The point where the feed enters the column influences the separation slightly; generally, a point midway up the column is best. Of course, product quality depends on composition of feed and the ratio of product withdrawal. For concentric tube type apparatus, the column must be in a vertical position to maintain laminar countercurrent convection.

► **Illusive Mechanism**—Just what happens during liquid thermal diffusion is hard to tell. From mass theory, at least as it works in the gaseous state, it would be expected that molecules of greater mass would be concentrated downward and those of less mass upward. Sohio's experiments show that molecular weight has little to do with liquid separations. More often than not, the heavier molecules concentrate upward, thus violating the mass theory as applied to liquid separations.

Relative shape of the molecules appears to be a much more important factor in determining the direction of concentration. Long chain molecules, when present with condensed

and more compact molecules, generally concentrate upwards regardless of their relative molecular weights.

▶ **Separating Hydrocarbons** – Liquid thermal diffusion has been used to separate many different petroleum liquids into their components. It has been used on kerosene, light virgin gas oil, light and heavy catalytic gas oils, solvent-extracted oil, cylinder stock, slack wax and isoparaffin-naphthene fractions, being particularly effective on the latter.

Liquid thermal diffusion is particularly useful in producing overhead fractions of high viscosity index. Since the process is largely independent of such properties as molecular weight, vapor pressure or solubility, it is not as limited as are other methods of improving viscosity index.

In one experiment, a 300 Red Oil was passed through the liquid thermal diffusion equipment. This produced a much higher viscosity index product than could be obtained by solvent extraction methods. The product had a viscosity index of 145, compared with 120 by furfural extraction. For a product of given viscosity, thermal diffusion resulted in much higher yields–60 percent of 115 viscosity index, compared to 40 percent by furfural extraction.

Overhead fractions in all cases have lower densities and are more paraffinic than the feed. Aromatics concentrate in the bottom fraction in these multi-component systems. In the isoparaffin-naphthene stocks, for example, the cyclic component concentrates in the bottom fraction. Color components in such stocks concentrate in the bottom.

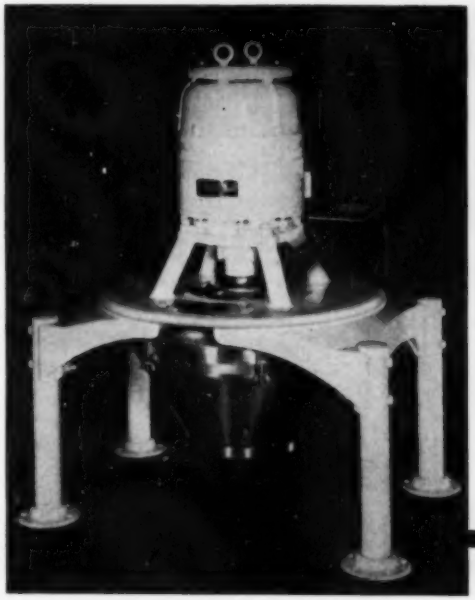
▶ **Other Applications**–Tall oil, a by-product from pulp and paper making, has been separated into saturated fatty acids, unsaturated fatty acids and rosin acids. Particularly significant here is the separation of the saturated from the unsaturated fatty acids. Soaps and drying oils have been made from these fractions.

Vitamins have been concentrated in fish oils, and in some instances the odor has been concentrated in one fraction. Similar effects have been obtained with vegetable oils.

▶ **Outlook**–At present, liquid thermal diffusion seems, from the economic standpoint, to hold most promise for the production of small quantities of highly valuable materials difficult or impossible to separate by other methods.

The investment on a commercial plant would be pretty high, since the equipment called for is essentially of the heat exchanger type. Operating costs would also be higher than for other separation methods, since the process depends on maintaining a

Cut Processing Cost–Improve Products with this New MIXER



Now in Use for
Soaps
Fertilizers
Insecticides
Plastic Powders
Flour Mixes
Dyes & Enamels
Detergents
and various free-flowing substances used in the chemical processing industries

The "ENTOLETER" Mixer requires only 12 cu. ft., with capacity of 12,000 lbs. of finished mix per hour. This equipment destroys all stages of insect life where beetle or similar insect infestation may be present.

The "ENTOLETER" Mixer is a new-type centrifugal machine designed to provide thorough mixing and blending . . . in faster time . . . at reduced cost. In actual manufacturing operations in the chemical process industries, this equipment is producing amazingly uniform mixtures, simply and economically.

CONTINUOUS MIXING: The "ENTOLETER" Mixer produces a finished mixture at rates up to 250 pounds per minute. Where ingredient percentages in a formula are sufficiently large to allow accurate metering, a truly continuous operation is achieved.

ADAPTABLE TO BATCH SYSTEM: The "ENTOLETER" Mixer is easily incorporated in the processing system as a final mixer. It serves to shorten mixing time, with consequent savings and appreciable improvement in product quality. Send for complete information. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1197 Dixwell Ave., New Haven 4, Connecticut.

ENTOLETER
CENTRIFUGAL MACHINES

FOR

PIPELINES . . .

FUME DUCTS . . .

PROCESS TANKS

WHERE CORROSION

IS A PROBLEM

You should investigate

PLA-TANK®

RESIN-BONDED FIBERGLAS®

This modern material is offered as **pipe** from 2" to 12", **duct** from 6" to 36", **sheets** 4' x 8' for general fabrication, **tanks** from 1/2 to several thousand gallons, **linings** for steel, cement or wood tanks and special moulded shapes for many purposes.

PLA-TANK

material resists attack by most acids, solvents, mild alkalis and a wide range of fumes. Withstands temperatures of at least 250°F. It may solve your corrosion problem!

WRITE FOR FREE DATA SHEETS

THE Chemical CORPORATION

61 Waltham Ave., Springfield 9, Mass.

temperature gradient and so has a high heat consumption.

But by improved exchanger design, resulting from experience, the cost of heat required could at least be minimized. And since liquid thermal diffusion does not depend on the same physical principles that other separation methods do, it may provide the only means for effecting some separations. The equipment is simple.

No solvents or other chemicals are required. The temperature range of operation is broad, and for thermally unstable materials temperature levels can be used that prevent decomposition. This could be particularly important in biological applications.

Some day liquid thermal diffusion may take its place beside distillation as another powerful tool for chemical processing. Meantime, it's not to be overlooked.

First Machinery has Contest Subject is Used Equipment

"My Happiest Experience With Used Equipment" is the subject of First Machinery Corp.'s present contest.

To stimulate interest in good used equipment during the emergency, First Machinery will award $1,500 in prizes to persons in the chemical and allied industry. Contest started November 1951, and ends October 1952. Awards are $100 for the best statement of the month, and $300 for the best article of the year.

All entries are to be sent to Contest Editor, First Machinery Corp., 157 Hudson St., New York 13, N. Y.

CONVENTION CALENDAR

American Pharmaceutical Manufacturers Association, eastern scientific section, Roosevelt Hotel, New York, January 29.

Manufacturing Chemists Association, air pollution abatement conference, Statler Hotel, New York, February 25-26.

Commercial Chemical Development Association, annual open meeting, Statler Hotel, New York, March 20.

American Chemical Society, national meeting, Buffalo, N. Y., March 23-27.

American Pharmaceutical Manufacturers Association, annual meeting, Boca Raton Club, Boca Raton, Fla., April 7-9.

National Agricultural Chemists Association, spring meeting, Fairmont Hotel, San Francisco, April 7-9.

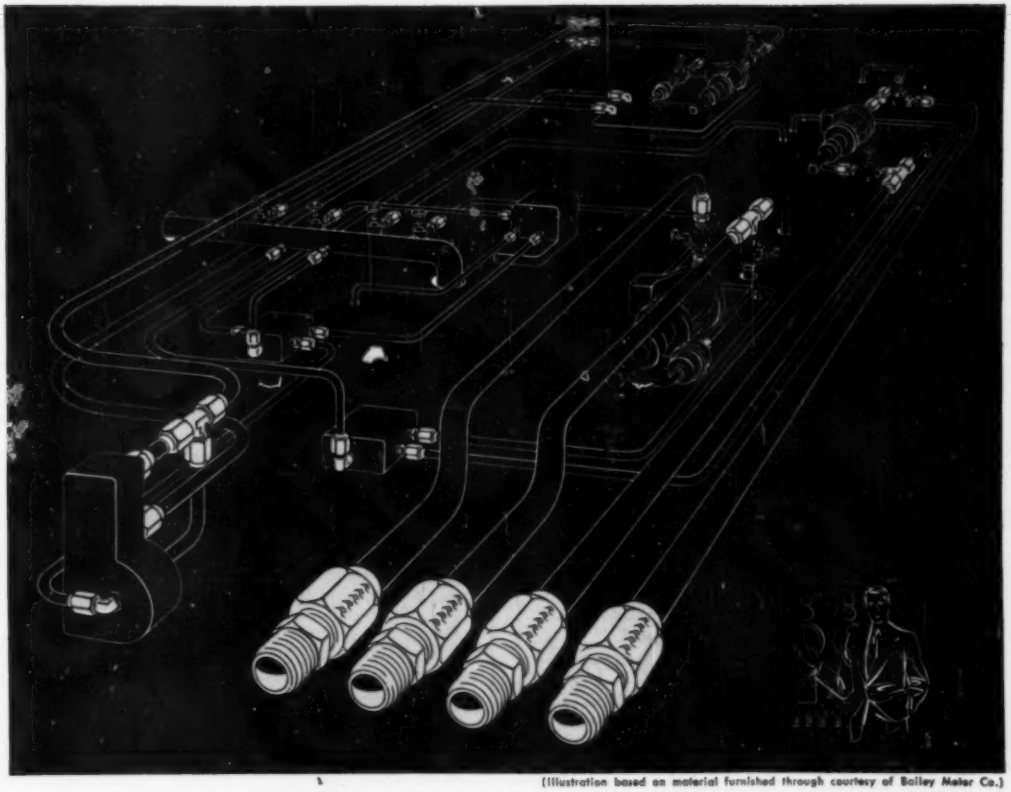
American Oil Chemists Society, spring meeting, Shamrock Hotel, Houston, April 28-30.

Parker

INDUSTRIAL TUBE FITTING

STOCKS CARRIED BY

AKRON	B. W. Rogers Co. P. O. Box 1030
BALTIMORE	Carey Machinery & Supply Co. 3501 Brehms Lane
	Whitehead Metal Products Co. 4300 E. Monument St.
BEAUMONT, Tex.	Standard Brass & Mfg. Co. 705 Milam St.
BOSTON	A. E. Borden Co., Inc. 176 Brookline Ave.
	Whitehead Metal Products Co. 281 Albany St.
BUFFALO	Whitehead Metal Products Co. 2128 Elmwood Ave.
CEDAR RAPIDS, Ia.	Globe Machinery & Supply Co. 309 8th Ave., S.E.
CHICAGO	Wallace Tube Co. 1300 Diversey Parkway
CINCINNATI	Williams & Co. 3231 Fredonia Ave.
CLEVELAND	W. M. Pattison Supply Co. 777 Rockwell Ave.
	Williams & Co. 3700 Perkins Ave.
COLUMBUS, O.	Williams & Co. 851 Williams Ave.
DALLAS	Metal Goods Corp. 6211 Cedar Springs Rd.
DAVENPORT, Ia.	Globe Machinery & Supply Co. 410 East Second St.
DENVER	Metal Goods Corp. 2425 Walnut St.
DES MOINES	Globe Machinery & Supply Co. East First & Court Ave.
DETROIT	J. N. Fauver Co. 49 West Hancock St.
HARRISON, N. J.	Whitehead Metal Products Co. 1000 South Fourth Ave.
HOUSTON	Metal Goods Corp. 711 Milby St.
INDIANAPOLIS	F. H. Langsenkamp Co. 229 E. South St.
KANSAS CITY, Mo.	Metal Goods Corp. 1300 Burlington Ave., N.
KNOXVILLE	Leinart Engineering Co. 412 E. 5th Ave.
LOS ANGELES	Haskel Engineering & Sup. Co. 721 W. Broadway, Glendale
	Metropolitan Supply Co. 353 East 2nd St.
LOUISVILLE	F. H. Langsenkamp Co. 339 W. Main St.
MEMPHIS	J. E. Dilworth Co. 730 South Third St.
MILWAUKEE	Mazman Belting & Supply Co. 522 W. State St.
MINNEAPOLIS	Vincent Brass & Copper Co. 100 North 2nd St.
NEW ORLEANS	Metal Goods Corp. 432 Julia St.
NEWPORT NEWS, Va.	Noland Company 27th St. & Virginia Ave.
NEW YORK	Whitehead Metal Products Co. 303 West 10th St.
NORFOLK, Va.	R. W. Hudgins & Son 3 Commerce St.
PHILADELPHIA	Louis H. Hein Co. 15 West Lancaster Ave. Ardmore
	Whitehead Metal Products Co. 1955 Hunting Park Ave.
PITTSBURGH	Williams & Co. 901 Pennsylvania Ave.
PORTLAND, Ore.	Hydraulic Power Equipment Co. 2316 N. W. Savier St.
ROANOKE, Va.	Noland Company 11 Salem Ave.
SAN FRANCISCO	General Machinery & Sup. Co. 1346 Folsom St.
SEATTLE	Eagle Metals Co. 4755 First Avenue South
ST. LOUIS	Metal Goods Corp. 5239 Brown Ave.
SYRACUSE	Whitehead Metal Products Co. 207 West Taylor St.
TOLEDO	Williams & Co. 650 E. Woodruff Ave.
TULSA	Metal Goods Corp. 302 North Boston
EXPORT	Mercator Corp. 438 Walnut St. Reading, Pa.
CANADA	Railway & Power Engineering Corp. Ltd. Edmonton, Hamilton, Montreal, Toronto, Vancouver, Windsor, Winnipeg



(Illustration based on material furnished through courtesy of Bailey Meter Co.)

Tube it up...Forget it!

WITH PARKER TRIPLE-LOK FITTINGS

This does it

Triple-lok . . . 3-piece flare fitting famous for its sleeve . . . the easiest way to install tubing systems. Made in brass, steel, stainless steel, aluminum alloy.

Precision Mark of

Leakproof Tube Fittings

Take meter panels, for example, where delicate instruments, actuated by air, steam or other fluids, must register with optimum accuracy at all times. More and more manufacturers of precision instruments and panel boards are choosing PARKER Triple-lok Fittings to make their tubing systems *remain* leakproof throughout their long service life.

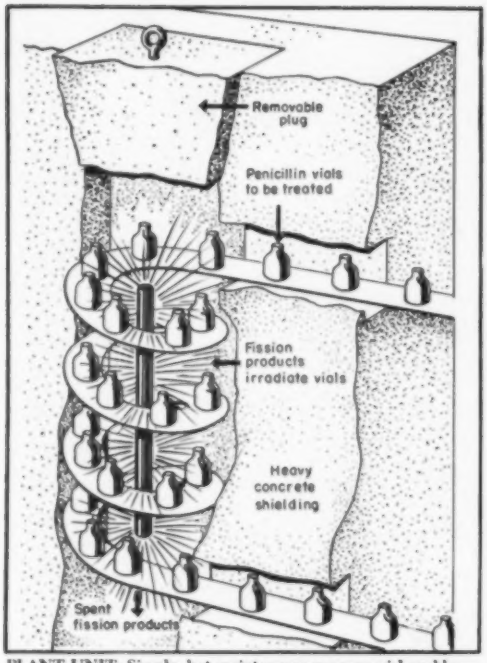
PARKER Triple-lok Fittings—as specified by the A.S.M.E. Code for Pressure Piping—are designed and precision made to be leakproof under even the severest conditions of vibration—elevated temperatures—high pressures—and repeated assembly...and to hold leakproof beyond tube bursting pressures. You will find PARKER Triple-lok Fittings not only on delicate instrument panels, but on all kinds of equipment where leakage in the tubing system would be too costly to be tolerated.

So tube it up and forget it . . . with Triple-lok Fittings. Ask your PARKER Distributor for PARKER Tube Fitting Catalog 4300, or write us direct. The PARKER Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

Parker

TUBE FITTINGS • VALVES • O-RINGS

Plants in Cleveland • Los Angeles • Eaton, Ohio • Berea, Ky.



PLANT UNIT: Simple, but maintenance poses special problems.

Cheaper Sterile Drugs

Faster, more complete sterilizing too — without heat. It's done with gross fission products, the residue from plutonium production.

The pharmaceutical industry will be keeping a pretty watchful eye on the industrial irradiation program of the Atomic Energy Commission this year.

Reason is that gross fission products—the byproducts of plutonium production—can sterilize heat-sensitive drugs and do it a lot cheaper than present methods.

One large drug producer in the New York metropolitan area is already installing a pilot plant for antibiotic sterilization—probably for penicillin.

Other big manufacturers have been sending samples for irradiation to the Food Laboratory at MIT, or to Yale or to Columbia or to any one of several other universities doing large-scale research for AEC. Coming in for most of the development work in the East, though, is Brookhaven National Laboratories.

Right now, eight or ten major firms are working hand-in-hand with Brookhaven on one form or another of the industrial utilization of gross fission products.

▶ **Why It's Vital**—Let's take penicillin as an example. To sterilize it today, aseptic handling techniques are used along with costly mechanical and chemical means.

On top of all this trouble and expense, the methods aren't sure. About 20 percent of the present output has to be destroyed in testing to make sure it's O.K. Even with these precautions, the Food & Drug Administration is not entirely satisfied, recently clamped down on the producers, told them they'd have to be more careful.

Considering these problems in the light of the total dollar volume of penicillin (crowding $150 million in 1951) it's not hard to see why the producers are more than eager to see what AEC has to offer.

And AEC has plenty to offer.

▶ **How It Works**—Let's assume we want to sterilize vials of penicillin at the rate of 100 per min. and that our sterilizing unit will operate 20 hr. a day.

Now take the drawing above to illustrate one way this might be done. The vials travel into a hollow concrete block. In the center of the block is a source of radiation. The vials travel around the source which is giving off 2,000,000 rep (roentgen equivalent physical). They are completely sterilized by radiation ionization which destroys living organisms, without an appreciable temperature rise, before they emerge from the block.

Since each vial weighs 40 g. (10 doses of procaine penicillin salt plus container), 10,600 lb. of material can be sterilized each day.

Based on this requirement, a source of 500,000 curies (1 curie equals 37 billion disintegrations per second of radioactive material) is needed.

An example of such a source would be semi-refined fission products of long half-life, similar to cesium 137 with a 33-year half-life or 2 percent decay per year. This means that about 20,000 curies would have to be added every other year to keep the unit at full strength.

AEC's job is to take its gross fission products (the soupy mixture of radioactive byproducts, water, salts and contaminants left from plutonium production) and refine and concentrate these to the desired strength and half-life. A successful pilot plant has been set up at Argonne National Laboratory in Chicago to concentrate radioactive wastes. (*Chem. Eng.*, Dec. 1951, p. 146.) Although the purpose of the plant is to reduce the high cost of burying wastes ($1 per gal. of radioactive material) it may well serve as the pattern for future concentrating operations.

Total cost of sterilizing penicillin is tied up with the cost per curie of the fission products. Stanford Research Institute indicates a range from 20 c. per curie on the optimistic side to $2 on the pessimistic side. Actually AEC spokesmen indicate that industry would be glad to pay up to $5 per curie for a successful scheme to cold-sterilize penicillin.

Assuming that the present total penicillin output were put up in 10-dose vials, the unit sterilization cost might be around 3.5 c. per vial using present techniques. The 20 c. per curie source material figures to 0.25 c. per vial for sterilization; the $2 curie material, 0.64 c.—or less than one-fifth present costs. Either the 20 c. curie or the $2 one is a bargain alongside present methods.

Of course the principles and costs applied to penicillin also hold (with necessary modifications) for streptomycin, hormones, vitamins, enzymes, plasma—in short, all heat-sensitive drugs.

There are a few problems to be ironed out:

- The problem of secondary effect—or dangerous induced radioactivity—in the product is more superstition than fact. AEC says fears are groundless.
- The problem of technical personnel to set up and service the irradiating installation. Will probably be solved this way: AEC will train its customer's personnel, provide its own teams of specialized technicians to make some initial setups or services and for the especially tough problems.
- Like any other potential hazard, the states will have to set up more or less uniform laws for safety in the use of radioactive materials. The Federal government may figure in overall standards of safety.

DEAERATED COOLING WATER SAVES ONE COMPANY

$85,500 a year!

REDUCES CORROSION RATE 90%
PREVENTS TUBERCULATION
CUTS TUBE REPLACEMENTS
LOWERS WATER CONSUMPTION

A chemical company in California installed a Permutit 5,000 gpm Vacuum Deaerator just over 2 years ago. Now here's what they have to say about it after exhaustive checking and comparison.

"The benefits occurring from water deaeration are difficult to calculate in their entirety, since so many of the advantages in small items such as clean water lines, better operation of valves, less frequent water line replacement and better water flow cannot be easily assessed. However, the major corrosion costs in this plant . . . have been determined and compared with the cost of deaeration . . ."

And the report goes on to cite actual net savings of $85,500 per year resulting from the installation of a Permutit Vacuum Deaerator.

Find out how Permutit can solve *your* water problems. Write to The Permutit Company, Dept. CE-1, 330 West 42nd Street, New York 36, N. Y., or the Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

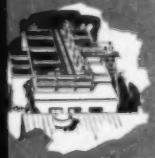
THESE BASIC PROCESSES, PLUS PERMUTIT SKILL, CAN SOLVE YOUR WATER CONDITIONING PROBLEMS

1. SLUDGE BLANKET HOT LIME SODA. Application of the sludge blanket to hot lime soda treatment reduces silica in boiler feed make-up, produces high quality steam.

2. HOT ZEOLITE—PERMUTIT Q. Subsequent treatment of water from hot lime soda treatment yields effluent of zero hardness. Permutit Q, or sulfonic base mineral resistant to high temperatures, replaces second stage phosphate treatment.

3. SILICA REMOVAL PLUS DEMINERALIZATION. Demineralization by cold ion exchange processes produces water comparable to distilled water only at a fraction of the cost of distillation. Treatment by anion exchange resin, Permutit S, reduces silica to less than 0.2 ppm.

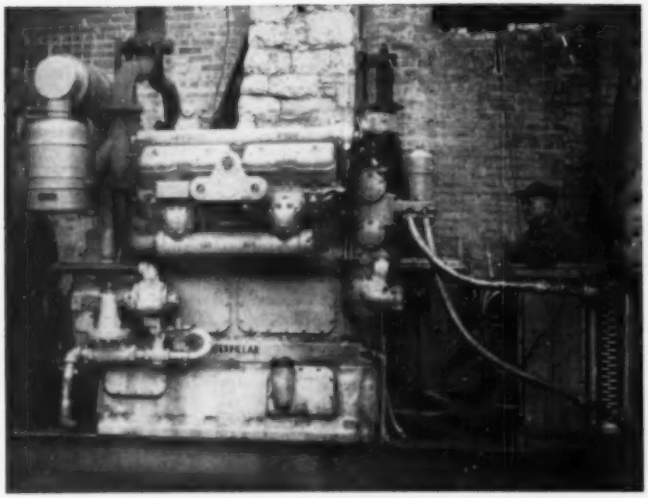
4. DEAERATING HEATER. The Permutit Deaerating Heater, utilizing exhaust or bled steam, prevents corrosion of feed lines, stage heaters, economizers, and boilers, by removing oxygen and free CO_2. Capacities from 12,000 to 1,400,000 pounds per hour are in service.



5. PRECIPITATOR. The Permutit Precipitator is used to lower alkalinity, reduce hardness, and help to remove turbidity, color, taste and odor. It can also be used to reduce silica.

PERMUTIT®

WATER CONDITIONING HEADQUARTERS FOR OVER 38 YEARS



DIESEL engine gives heat and powers the compressor for vapor recompression.

A Radical Tack in Salt Making

New technique uses vapor recompression cycle with a simple, single-effect evaporator. Results: for the first time, an efficient, low-cost, small-package salt refinery.

After more than two years of development work, engineers at the Manistee Iron Works Co., Manistee, Mich., can now take pride in the operations of their first small-package salt refinery. It goes on stream this month in South America.

What's more, they can also take pride in their decision to make a radical departure from the usual multiple-effect evaporation system. This cannot operate efficiently and economically in many parts of the world.

Instead, the Manistee design applies a vapor recompression cycle to a single-effect evaporator. It gives a compact, easily erected, easily moved packaged plant that can be set up in remote areas with limited cooling water, transportation facilities or markets.

Its simple design and high heat recovery give low operating and maintenance costs, make it economical to operate a unit with a capacity as low as 10 tons of refined salt a day. A conventional multiple-effect evaporation system needs a capacity of 50-75 tons a day for efficient operations.

▶**For U.S. Chemical Plants?**—Although the new design was worked out largely to give remote areas a practical, packaged salt plant, it may pan out to be of more-than-passing interest to U.S. chemical processing firms.

Some chemical users or processors of salt—those located at a distance from their source of supply—might find that they could save heavy freight charges by using local brines or salt. Some firms, for example, might be interested in turning out small tonnages of high-purity salt for captive use if the cost could be kept close to $5 per ton.

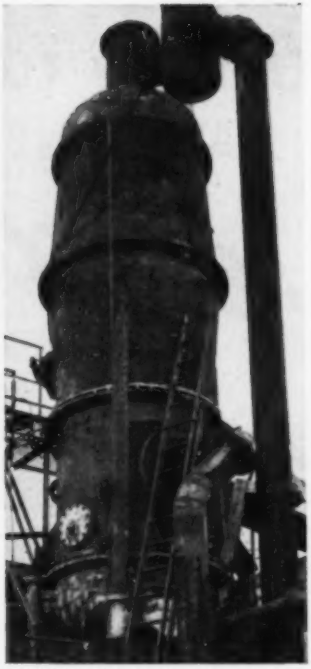
Besides, it's now believed that the Manistee unit can be adapted to evaporate liquids other than salt brines. This might very well open up big possibilities in the chemical processing field.

▶**Two Up, Four to Go**—Manistee's first unit, now beginning operations, will turn out 24 tons of refined table salt daily. It was built for Antonio Zoghbi, Venezuela's salt king, at Caracas. This unit was actually test operated at Manistee's plant in Michigan, then dismantled and shipped to South America.

A second unit, now going up in Rio de Janeiro, will go on stream during March. It is being built for the Brazilian firm of Salmac and will have a capacity of 24 tons daily.

Although the development was first announced less than a year ago (*Chem. Eng.*, April 1951, p. 74), four more packaged units are already projected for S. America. Two of these will be 100-ton plants and will require 1,000-hp. diesel engines; the 24-ton units take 340-hp. diesels.

Interest is also keen in Greece, Israel, Portugal and a half dozen other countries, says Louis J. Deranja. He is manager of Manistee's export department in New York.



EVAPORATOR has high heat efficiency.

Although the Manistee design calls for a complete plant—from making brine to packaging the refined salt—the success of the development hinges on three features:

- Diesel - powered recompression and vapor phase heat recovery;
- A simple, single-effect evaporator that operates at atmospheric pressure;
- A stack-type dryer that does away with the need for cooling equipment.

▶**High Heat Recovery**—Manistee's evaporating system—a bold departure from conventional U.S. methods—hinges on recompression and vapor phase heat recovery.

A standard type diesel engine supplies process heat from both the cooling system and exhaust; it also powers the rotary vapor compressor. This compressor was built by Read Standard Corp. after much study of the special problems.

REEVES Variable Speed Transmission

The *original*, mechanically correct unit for providing complete, stepless speed adjustability.

Industry's most widely used unit for adjusting machine speeds . . . for all these good reasons:

1. Incorporates the REEVES operating principle—proved in 300,000 installations—which assures *accurate, positive* delivery of any desired speed within the entire speed range, without stopping the machine.

2. Makes "changeovers" easier—utilizes the machine's *full* capacity—by providing the *right* speed—with the turn of handwheel or touch of button—for every operation and every operator, under every changing condition.

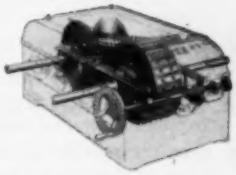
3. Wide choice of vertical and horizontal models—capacities up to 87 hp; in speed ratios of 2:1 to 16:1; manual, electric, hydraulic or completely automatic controls; suitable for mounting in any position. Also "Internals" for mounting within machine framework.

4. Easily installed on your machines. Ruggedly constructed with few moving parts subject to wear . . . requires no special tools or training to maintain.

5. Used on more different kinds of machines in a greater variety of industries than any other single variable speed drive.

Profit from REEVES Speed Control in your plant—*see immediate results.* Send for full details on REEVES Speed Control—ask for catalog No. CE68a-G.

Operating Principle



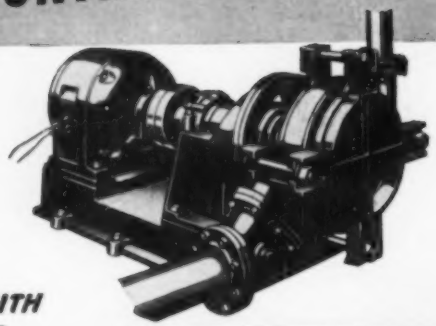
REEVES Variable Speed Transmission embodies the proved operating principle of a V-belt driving between two pairs of cone-shaped discs, mounted on parallel shafts and adjustable to form an infinite number of driving and driven diameters. One shaft receives power at constant speed from motor, line shaft, etc. Other shaft delivers power at infinitely variable speeds to driven machine. Each speed setting is held without fluctuation. Operation is practically noiseless.

REEVES PULLEY COMPANY · COLUMBUS, INDIANA

Recognized leader in the specialized field of speed control engineering

accurate · variable
REEVES *Speed Control*

Longer Hours of... CONTINUOUS SERVICE



WITH A **MORRIS** TYPE R SLURRY PUMP

The 4 features of the Morris Type R Slurry Pump mean low-cost operation . . . minimum "lay up" time.

1. **Easily dismantled**—Impeller and shaft sleeve are renewable without disturbing piping or bearings.

   Four easy-to-get-at outside clamping bolts hold impeller, liner, shell and cover firmly in place.

2. **Simpler design**—The Morris Type R Slurry Pump has no troublesome internal bolts or studs.

   Gland is under suction pressure only. Hence, it's less vulnerable to abrasive solids . . . less subject to packing troubles.

   Four adjusting screws close the worn clearances on the suction side of impeller. This adjustment moves the entire rotating assembly as a unit.

3. **Corrosion-abrasion resistant**—You may have the Morris Type R with its moving parts in any of various metal alloys, depending upon the kind of slurry you handle. Parts are quickly interchanged.

4. **Shell is interchangeable for right or left-hand rotation**—Permits 72 different combinations of suction and discharge nozzles.

5. **FREE TECHNICAL SERVICE**—Morris Engineers have been building pumps for more than 80 years. They will be glad to recommend the pump best suited to your needs. No charge or obligation.

FOR LESS TROUBLE . . .
LESS MAINTENANCE . . .
LESS LAY-UP TIME . . .
and LONGER HOURS OF CONTINUOUS OPERATION

Specify MORRIS TYPE R SLURRY PUMP

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS *Centrifugal Pumps*

This diesel set-up does away with the need for boilers and other power plant equipment. Except for a small amount of makeup water—about 500 gal. per hr. for a 25-ton plant—the condensate is ample for both engine cooling and brine preparation.

Tied in with the diesel and compressor is a Fernsworth-Toby-Deranja evaporator developed by Manistee engineers. This simplified unit (see cut) uses hot engine condensate in its calandria section. It is operated at atmospheric pressure and needs no outside brine heating element. This single-effect evaporator does away with the usual multi-effect vacuum pan system, barometric condenser and vacuum air pump.

The FTD evaporator compares very favorably with the best multi-effect evaporator units. In one extended preliminary test at Manistee with fuel (19,000 Btu. per lb.), the FTD evaporator and diesel combination required only 80 lb. of fuel per 2,000 lb. of salt as compared to the 110 lb. required by a quintuple-effect evaporator with boiler and the 280 lb. taken by a double-effect with boiler.

▶ **Simple Stack Dryer** – Manistee's unit incorporates a custom-built continuous centrifugal salt filter that discharges the cake at 1-2 percent moisture. The performance of this filter, together with the small size of the plant, makes it feasible to use a simplified dryer.

In the conventional rotary dryer the salt is heated to a high temperature and then cooled for packaging. Manistee's stack-type dryer keeps the salt at a constant temperature and does away with the need for cooling equipment.

It is a simple vertical stack down which the moist salt falls countercurrent to a stream of hot air. This type of dryer cuts down salt breakage and inhibits to some extent the later caking of the packaged product.

▶ **Small Area, Little Labor**–By close coordination of power and evaporator units, the design and control of the packaged plants are streamlined; building needs and operating supervision are cut to the bone.

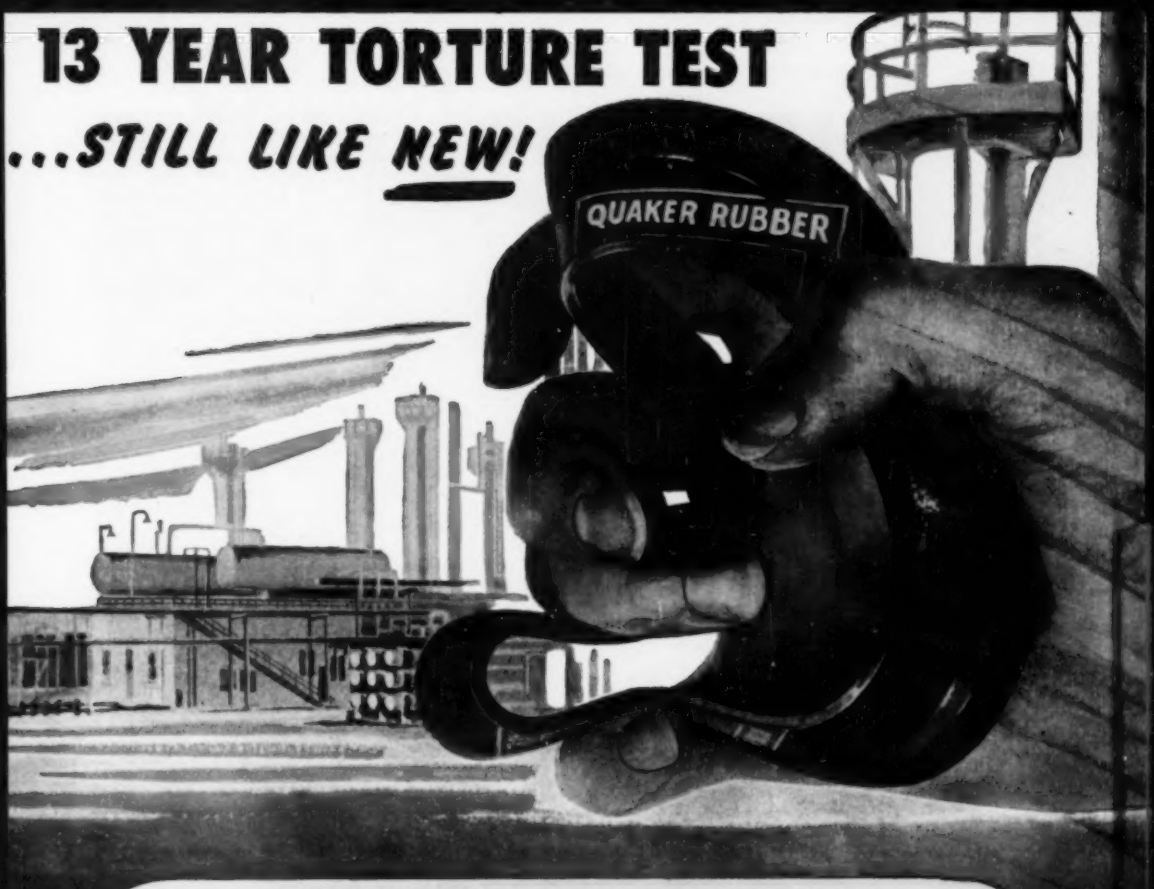
Total plant area, for example, is about 65 percent less than for a conventional multi-effect steam plant of the same size. (A 25-ton Manistee unit needs only about 1,000 sq. ft. of floor space.) The total shipping weight is close to 75 percent less.

A conventional salt plant of 100-ton daily output usually needs an operating crew (exclusive of packaging) of six men per shift; the Manistee design cuts this down to two men.

(Continued)

13 YEAR TORTURE TEST

...STILL LIKE NEW!



QUAKER PACKINGS

Provide Positive Seal... Retain Flexibility Despite High Temperatures and Pressures

Here's a seat gasket cut from Ebonite Sheet Packing that rolled up thirteen years of trouble-free service on a pop-off pressure relief valve in a southern plant... withstanding high temperatures and pressures... eliminating leaks and shutdown time, assuring absolute safety. Only extensive changes requiring different sized gaskets made it necessary to replace this gasket at all!

Performance like this is made possible because of Ebonite's remarkable leak-proof characteristics and the fact that it will not carbonize, melt or become hard. That's why Ebonite is ideal for high pressure joints and flanges; for use with superheated steam, ammonia, brine, air, oils, acids, caustics, gases, hot or cold water.

For all your requirements—whether packings or belting for conveying materials... flat or V-belts for driving steam engines, steam turbines or electric motors... hose for flushing, suction, cleaning or fire fighting purposes—see your Quaker distributor, or write direct to us.

HOSE FOR RUGGED WEAR

Hose for air, steam, water, oil, gas or paints, Quaker makes it to fit the needs of the Chemical Industry. Each is pre-tested for peak performance.

BELTING FOR MAXIMUM HORSEPOWER

Flat belts or V-belts, Quaker has the one to fit the drive... to transmit maximum horsepower at the lowest operating cost... all pre-tested to assure peak performance.

QUAKER RUBBER CORPORATION

DIVISION OF H. K. PORTER COMPANY, INC.

PHILADELPHIA 24, PENNA. BRANCHES IN PRINCIPAL CITIES

an ACCO product

HELICOID

The gage that retains its original accuracy longer, wears longer, costs less per gage, per year

The greatest achievement of the gage makers' craft—pressure gages without gears. The Helicoid movement... tested and proved in years of hard service ... is a simple cam and roller arrangement that gives long, trouble-free service.

FOUR HELICOID FEATURES

1. Stainless Steel Helicoid Roller (no gear teeth)
2. Stainless steel hair spring
3. Long Life Cam (no gear teeth)
4. Monel link and screws

• HELICOID GAGES, which do not have gear teeth to wear out, are made in a full range of pressures... in various sizes and shapes, with black, white and radiant faces. For wall or stem mounting, flush or panel mounting, or flangeless. No finer gages are made. Helicoid Gages cost less in the long run.

ACCO

Write today for the Helicoid Gage catalog.

HELICOID Pressure • Vacuum GAGES

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE

925 Connecticut Avenue • Bridgeport 2, Connecticut

NEWS, cont. . .

Maintenance costs, too, are slashed through simplification and the use of less equipment. Manistee engineers estimate that their unit cuts down maintenance costs 40 percent or more.

With advantages such as these on the horizon, engineers throughout the salt industry are watching with keen interest the performance of the first commercial Manistee units in South America.

Vegetable Oil Industry Moving to Southwest

Vegetable oils may become more important than petroleum in the economy of the Southwest.

This is the opinion of Klare S. Markley of the Southern Regional Research Laboratory, New Orleans, who received the 1951 Southwest Award for outstanding contributions to chemistry last month at the Seventh Southwest Regional Meeting of the American Chemical Society in Austin, Tex.

At the meeting Markley noted several other trends and developments in the industry:

Soybeans moving South: "Arkansas, Oklahoma and Louisiana produced more than 190 thousand tons of soybeans, equivalent to approximately 63 million pounds of oil. This oilseed crop is moving southward at an increasing pace and in the years to come production in the Southward states may equal or exceed that of the corn belt states."

Tung moving West: "The tung industry, which began in Florida in the late 1920's, has been moving westward and now centers around the coastal area of Louisiana and Mississippi with some production of tung fruit in East Texas."

Castor has a future: "This country has heretofore been dependent on foreign sources, principally Brazil, for its supplies of castor. Early this year at the request of the Munitions Board, the Commodity Credit Corp. undertook a program intended to develop a domestic supply of 34 million pounds of castor oil. If this program proves successful the Southwest can look to another new and expanding vegetable oil industry."

New strains of sesame: "For the past five years an intensive research program has been under way at various Texas institutions to develop new strains and varieties of one of the world's eldest oilseed crops—sesame. It yields more oil to the acre than any other annual oilseed. If these prove to be a success another oilseed will soon join the growing list of such crops in the Southwest."

Safety and savings tip!

Illustrated—a few of many types of Sylphon Packless Valves. Sizes range from ⅛" to 6". No. 304-NV is especially suited for vacuum service.

Sylphon Packless Valves prevent leakage—in or out

● Once Sylphon Packless Valves are installed on pipe lines carrying gasoline, oil, or other volatile liquids and vapors, leakage stops instantly! You and your equipment are protected against possible fire, explosion or other damage. You gain more, too. For these valves prevent wastage—provide vacuum protection.

There's no packing to leak or replace. A rugged, seamless Sylphon metal bellows replaces customary packing. The bellows eliminates leaks that might seep past the stuffing box of even the best packed type valve. It seals the valve stem against corrosive, dangerous or inflammable liquids or gases.

Many sizes and types made of brass, monel, stainless steel, etc. Widely used in chemical plants, oil refineries, power plants, aboard ships. Ideal as standard equipment. Get complete information; write for Bulletin AC-813.

FS

FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

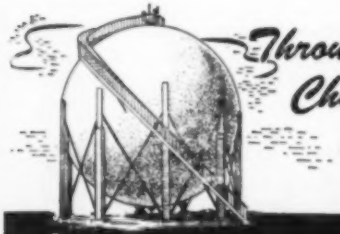
Canadian Representatives, Darling Brothers, Montreal

ASK THE
AEROFIN
MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.



Throughout the Chemical Industry —

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Diamond Starts Construction

Driving the first piling, workers start construction on a new building, the first of several to be built under Diamond Alkali's multi-million-dollar expansion program. New construction, which includes a perchloroethylene plant, will take place alongside the company's large Painesville (Ohio) works. The expansion program, expected to be completed in two years, will enable Diamond to double its chlorine-caustic production by the electrolytic method.

Big Alcan Plant to Get Power From British Columbia Dam

Last month evidence of the industrial boom in British Columbia continued to show up. Work began on the 1,500-ft. long Nechako River dam, key to the Aluminum Co. of Canada's multi-million dollar hydro-refinery project in the Tweedsmuir Park-Kitimat area.

When completed a powerhouse will initially supply 315,000 kw. for production of 84,000 metric tons of aluminum. Target date for first output is the spring of 1954. Ultimate capacity: 1.3 million kw. for 500,000 metric tons.

Completion of the 325 ft. high dam is expected next fall. Water then will start backing up into the Tweedsmuir Park seven-lake system to supply a head for the power house at Kemano. Crews now are fighting time to get things underway before the winter freeze sets in.

Work is also under way on a 10-mi. tunnel at the west end of the lake system. It will bring water from Tahtsa Lake to the powerhouse. Engineers are drilling from both ends, and drilling crews at the eastern end at 2,600 ft. level are being supplied by helicopter.

Get

something extra

when you buy

lead sheet

When you place an order for lead sheet, chances are you state quantity, composition, size and weight, and that's all.

When you buy from National, you not only get sheet that meets these four specifications but you also get certain "extras"—extras characteristic of the *high quality* lead sheet made by the leader in lead.

Such as

(1) A smooth, even finish.

(2) A surface as free of flaws as careful milling can make it.

(3) Uniform over-all gauge.

(4) Maximum structural strength throughout.

These extras contribute to adaptability, workability, and durability – whether the sheet is used for handling corrosives, for architectural installations, or for radiation barriers.

It is these extra qualities, not specifically stated in your order, that give National Lead sheet its dependability on the job.

That's why we say—when you want lead sheet—come to National. And get something extra.

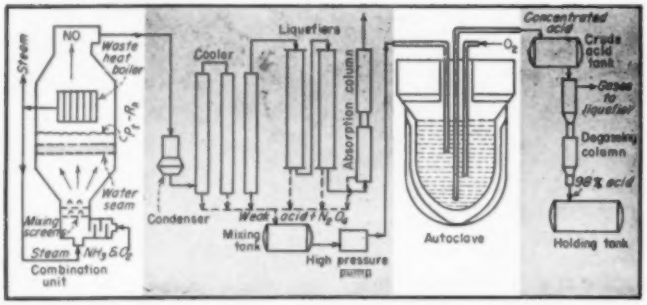
Sheet Lead

with a **NATIONAL** reputation

LEAD COMPANY

New York 6; Atlanta; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Dallas 2; Philadelphia 25; Pittsburgh 12; St. Louis 1; Boston 6 (National Lead Co. of Mass.); Los Angeles 23 (Morris P. Kirk & Son, Inc.); Toronto, Canada (Canada Metal Company, Limited)

*Reg. U. S. Pat. Off.



Fauser Process Improved

German nitric acid process is now continuous, more compact. Claimed to make a cheaper high-concentration nitric for use in explosives, it may sell here.

Today's market conditions are mainly responsible for interest in the process industries and government agencies in nitric acid processes, and particularly in the improved Fauser process:

• Current demand for highly concentrated nitric is up. The explosives industry particularly is calling for it. And the government has shown considerable interest in its use in rocket fuels.

• The sulphur shortage is another factor: Nitric acid processes in this country turn out a 50-60 percent acid, and substantial quantities of sulphuric are needed to concentrate this acid. Attractive feature of the improved Fauser process is the direct manufacture of a 98 percent acid. No sulphuric is needed for concentration.

Invented by an Italian, the Fauser process has undergone a wide improvement in the last 20 years in Germany. Principle of Giacomo Fauser's process is the pressure-temperature treatment of low-concentration nitric (around 60 percent) with oxygen and nitrogen tetroxide in an autoclave to obtain a 98 percent acid.

Developed principally by Bamag-Meguin of Berlin (known in Europe as the Bamag process) its operation has been made highly versatile. It can now make a high or low-concentration acid using either oxygen or air as raw materials. And it can turn out a high-concentration acid using either batch or continuous methods.

Although never set up in this country, the process has monopolized use outside the U.S. Plants have been built in Switzerland, Sweden, France, England, Poland, Hungary, Rumania, Italy, Spain, Japan and Germany. At this moment plants are going up in Spain and Italy. And negotiations are going on in Egypt.

Bamag is now trying to sell here. And it may soon. Through its American representative, General Industrial Development Corp., New York, it is negotiating with several companies, here and in Canada, for possible use in fertilizer production. Process to be used is the manufacture of a low nitric using oxygen.

►**Continuous**—Big improvement is the newly designed autoclave permitting continuous output of 98 percent acid. The autoclave is made of forged steel on the outside, aluminum on the inside, and an aluminum liner in between to prevent acid attack on the steel.

How it functions: The autoclave receives oxygen through a feed pipe that reaches nearly to its bottom. It receives mixed 60 percent nitric and nitrogen tetroxide from a specially designed pump at a pressure of 52 atm. Temperature is held at 70 deg. C.

Concentrated 98 percent acid passes continuously out the top through regulating instruments and into an overhead tank. The instruments record the amount of oxygen present in the effluent, and regulate incoming oxygen supplies. Reaction is controlled thereby.

►**More Compact**—Another improvement is the combination "water seam" element and waste heat boiler. The water seam element, which forms the bottom half of the unit, handles the catalytic conversion of ammonia and pure oxygen into nitric oxide.

How it functions: Ammonia and oxygen enter at the bottom of the unit, pass over baffles, and then through a mixing screen. Along with incoming steam, they pass through a water seam. Purpose of the seam is to take up the turbulence of the chemical reaction.

From the seam the oxygen and ammonia come in contact with a platinum-rhodium catalyst. Nitric oxide is formed. The reaction probably takes place at a higher temperature (850 deg. C.) and shorter contact time (0.0001 sec.) than any other known case of contact catalysis.

Nitric oxide then passes through the waste heat section and out the top of the unit, ready for further processing and oxidation. Part of the steam from the waste heat boiler passes to the bottom of the unit where it mixes with incoming oxygen and ammonia. The rest of the steam is put to use where needed. For example, it could be used in nearby bleaching or fertilizer operations.

Engineer Tells AIChE New Waste Removal Method

Older methods of removing waste and sewage from water, because more equipment and space are needed, cost more. The new method described by Clyde C. DeWitt, director of the engineering experiment station at Michigan State College, at the 44th annual meeting of AIChE in Atlantic City last month, costs one-third less than present methods.

The new method, adapted from a process used in some paper mills, is also more efficient. It gets rid of waste products such as oils, very fine metal, particles and fibers that will not quickly settle out and are not affected by bacterial action.

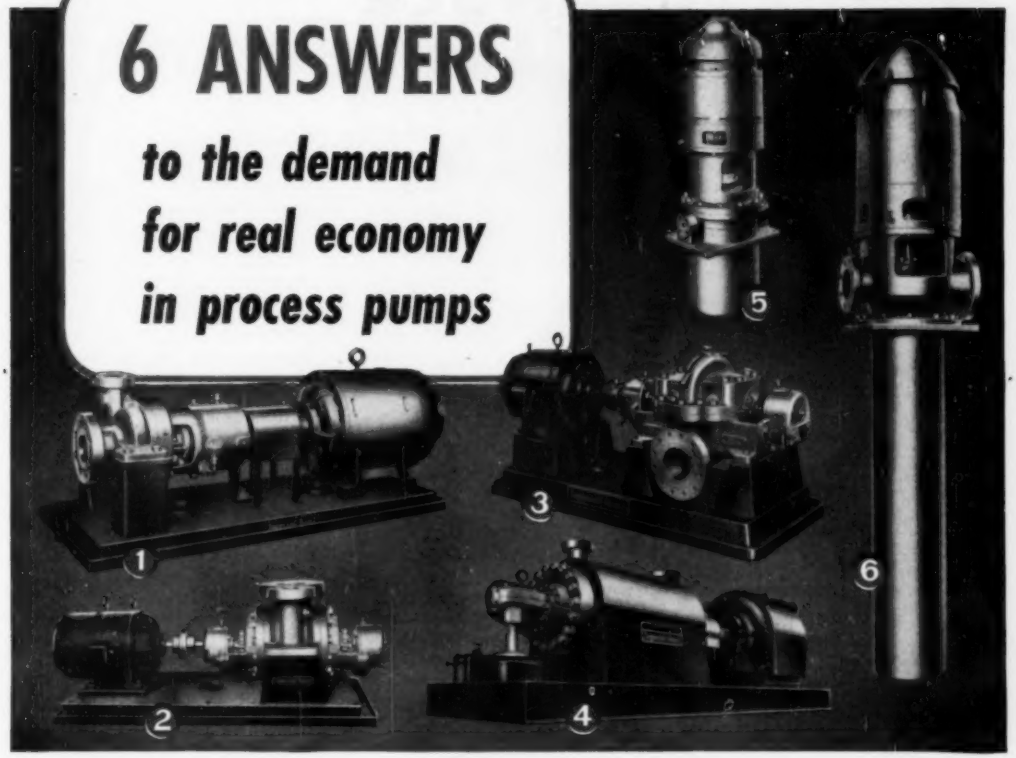
How it works: After aerating, pressure is applied to the waste water. Air becomes trapped in the water. When the pressure is released, millions of tiny bubbles rush to the surface just as they do when a bottle of soda is opened. These bubbles carry away practically every bit of chemically treated waste material suspended in the water. The clear water then is returned to a lake or stream.

Better Insecticide Shipped To Army in Japan and Korea

DDT, once considered medicine's best weapon for controlling typhus-transmitting lice, has fizzled in Korea. Korean strains of body lice show a high resistance to DDT. However, test conducted by the U. S. Quartermaster Corp. show that Lindane, an-

6 ANSWERS

to the demand for real economy in process pumps



These six types of Ingersoll-Rand process pumps offer you important savings

For most applications, there's an Ingersoll-Rand pump that is right for the job. This means more than just meeting design conditions—it means construction of the right materials and the right sealing arrangement, with either the Cameron Shaft Seal or an adaptation of a packed stuffing box.

Let your nearest I-R representative give you the details on the real economy of I-R pumps—through their high sustained efficiency, economical operation, and low maintenance.

	PUMP TYPE	STAGES	CAPACITIES	HEAD
1	Vertically split with top (or bottom) suction and discharge or end suction and top discharge	Single stage	20 to 3200 gpm	Heads to 600 feet
2	Vertically split with top suction and discharge	Single stage	250 to 3500 gpm	Heads to 1100 feet
		Two stage	200 to 1200 gpm	Heads to 1100 feet
3	Horizontally split with side suction and discharge	Single stage	30 to 2300 gpm	Heads to 750 feet
		Two stage	170 to 1300 gpm	Heads to 1100 feet
4	Diffusor type with "double-case" construction. Top suction and discharge.	Multi stage	450 to 3000 gpm	Heads to 6000 feet
5	Vertical pump, diffusor type	Multi stage	20 to 400 gpm	Heads to 4800 feet
6	Vertical pump, turbine type	One or more stages	60 to 35,000 gpm	Heads to 150 feet per stage

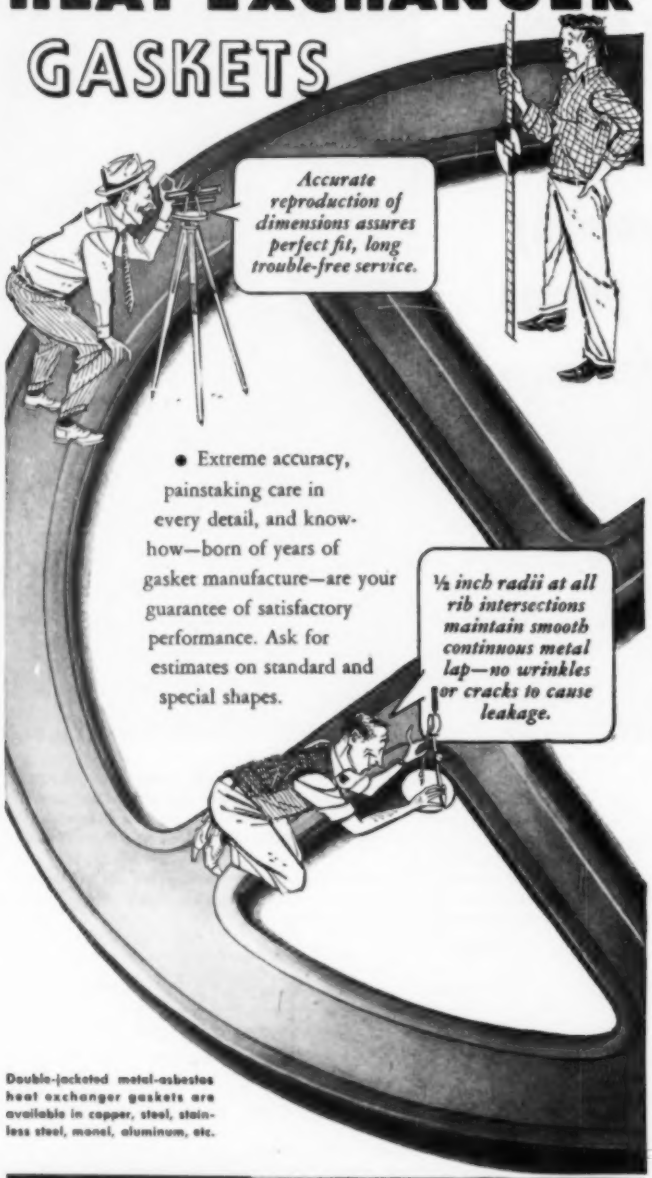
Compressors • Air Tools • Rock Drills
Turbo Blowers • Condensers • Centrifugal Pumps
Diesel and Gas Engines

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

389-10A

HEAT EXCHANGER GASKETS


Accurate reproduction of dimensions assures perfect fit, long trouble-free service.
• Extreme accuracy, painstaking care in every detail, and know-how—born of years of gasket manufacture—are your guarantee of satisfactory performance. Ask for estimates on standard and special shapes.
½ inch radii at all rib intersections maintain smooth continuous metal lap—no wrinkles or cracks to cause leakage.

Double-jacketed metal-asbestos heat exchanger gaskets are available in copper, steel, stainless steel, monel, aluminum, etc.

UNITED STATES GASKET COMPANY

628 N. 10TH STREET, CAMDEN, N.J.

LEADING FABRICATORS OF "TEFLON" FOR THE CHEMICAL, PROCESS AND ELECTRONIC INDUSTRIES

UGS

other insecticide powder, will kill the lice and many other insects that DDT won't.

Last month California Spray-Chemical Corp. delivered a million pounds of Lindane to the armed forces in Japan and Korea.

Pacific Mills to Install New Chemical Recovery Unit

To relieve the overload on the present unit, Pacific Mills, Ltd. plans to install a new 75-ton Babcock & Wilcox chemical recovery unit at its kraft mill at Ocean Falls, Canada.

The new unit will operate in conjunction with the existing 120-ton Tomlinson recovery unit. It will consist of a water-cooled furnace, a two-drum Stirling boiler, superheater and air heater. Meter and controls will be centrally located on a common panel.

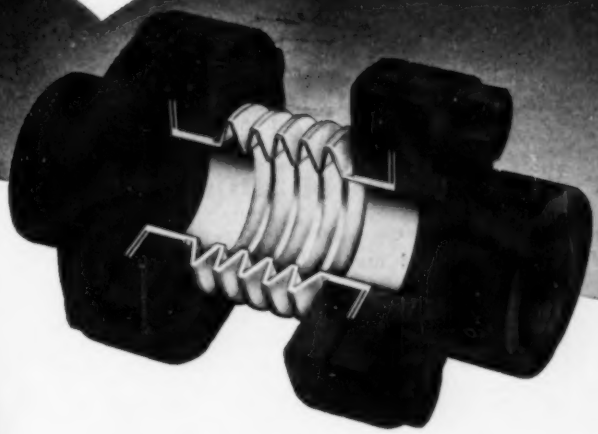
By early 1952 the boiler should be on the line. Building alterations and boiler support erection will begin by next June. A new electrical substation will house all electrical equipment for both units. A one-ton automatic elevator is also being installed. Total cost of the project: about $800,000.

Fuel will be concentrated black liquor at 53 percent solids, supplied from an existing direct heat evaporator. No evaporator will be put in with the new recovery boiler, but provisions will be made in the duct layout for the addition of a cascade evaporator.

Steam pressure and temperature, like that of the Tomlinson, will tie in with the steam-driven power generating units in the main steam plant.

SHUTTLE system helps a southern chemical plant move materials fast. Four Baker trucks shuttled by an intra-plant trailer between buildings now handle 4.5 million pounds a month. This air strip steel matting overcame a serious handling bottleneck by serving as a flooring in an emergency warehouse.

NEW... TEFLON BELLOWS CONNECTOR



- CORROSION RESISTANT
- HEAT RESISTANT
- ELECTRICALLY NON-CONDUCTIVE
- FLEXIBLE EVEN AT MINUS 94° F.
- AS STRONG AT 482° F. AS AT 70° F.
- NON-ABSORBENT

Maximum expansion and contraction provided.

French-type gasket provides easy installation.

Withstands repeated flexing without damage.

The answer to difficult piping problems in your plant

Here is the new "JOHN CRANE" Teflon Bellows Type Connector which will solve many problems in the chemical industry. Fabricated of chemically inert Teflon, it economically serves as a vibration dampener as well as an expansion joint—connects misaligned couplings. The unusual properties of Teflon allow the expansion joint to be flexed repeatedly without damage.

End flanges of the joint are actually French-type envelope gaskets made integral with the joint for simple assembly between companion flanges . . . insures a tight, leak-proof seal on installations. John Crane Bellows Connectors are made to your specifications in a wide range of sizes to fit your particular needs.

Consult with "JOHN CRANE" engineers now on the uses of remarkable new Teflon in effectively handling corrosive liquids and gases.

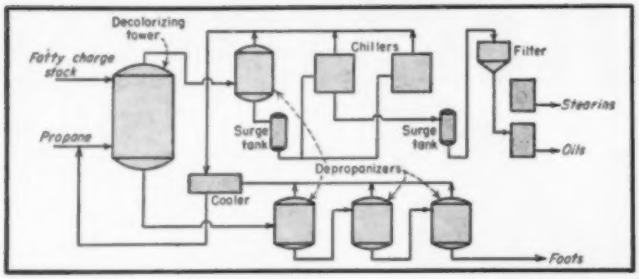
Write for informative catalog on Teflon and its applications.

JOHN CRANE

CRANE PACKING COMPANY

1809 BELLE PLAINE AVE. • CHICAGO 13, ILLINOIS

Offices in All Principal Cities in United States and Canada



Brown grease	78.8% Red oil 18.2% Stearin 3.0% Foots
Hydrolyzed white grease	58.8% Oil 38.2% Stearin 3.0% Foots
Sperm oil	92.9% Oil 7.1% Sper-maceti
Lard oil	Very light #1 lard oil

This process + These raw materials = These products

Finer Fatty Fractionation

New solvent process gives purer, lighter, less-viscous fractions of fatty materials. Improved or new products turned out from a variety of charge stocks.

A new fractionation process for fats and oils gives improved old products plus a bonus of new ones. And with this, yields are higher, fractions better.

This solvent process, developed by Swift & Co. at its plant in Hammond, Ind., is the result of plant-scale test runs. Although the new techniques are only in limited use, Swift has already marketed several improved grades of fatty materials.

Improved products are:

- Red oil produced without distillation, comparable in color and titer to the double distilled grade.
- Stearic acid with color, ash and titer equal to triple-pressed grades.

New products are:

- Lard oil of light color with high free fatty acid content, available commercially for the first time.
- Sperm oil with a better color and lower pour point than that produced by conventional seeding and pressing methods. The sperm oil itself may be fractionated to give high unsaponifiable and glyceride fractions. Possible uses: for fatty alcohol and lubricating grease manufacture.

Reason for the better yields and fractions lies in the efficient removal of metallic soaps, oxidized fats, and the reduction in the viscosity of polymerized fats. The process also does a good job of removing color bodies and impurities that interfere with operations.

A wide variety of charge stocks may be processed. They include tallow, grease, hydrolyzed or unhydrolyzed vegetable or marine oils, synthetic esters and fatty acid derivatives, and animal, vegetable or marine fatty acids.

Some of the techniques of the process are now in use, but use of all of them would require a new plant. Swift's present plant capacity can handle all material available for processing; hence no new plant is proposed. However, the patented process is open for licensing by others.

▶ **How It Works**—Liquid propane and charge stock feed into the decolorizer tower at a 20:1 ratio. The tower operates at a pressure of 465 psi. and 175 deg. F. A temperature differential of 2-10 deg. between top and bottom of the tower gives good separation of color bodies and phases. The interface thus established separates solutions of decolorized phase (top) and foots (bottom) in about a 40:1 ratio.

Declorized phase drawn off the top passes through a pressure reducing valve to a depropanizer where the propane-oil ratio is reduced to 4.5:1. Propane evaporation could potentially chill the solution to −50 deg. F. To prevent this, 50-lb. steam is added to maintain first stage temperature at 120 deg. F. Temperature is controlled in the depropanizer so that cooling and crystallization in subsequent stages will give readily filterable solids. The pressure of the vapor formed is such that a simple condensing operation will liquefy it for re-use.

Partially depropanized solution passes to a surge tank which feeds the batch chillers. A vapor space in the chiller permits propane evaporation and resultant cooling.

A pressure relief valve throttles evaporation to allow a temperature drop in solution of only 1-2 deg. F. per min. A 90-min. chill seems to be best with pressure dropping from 250 to 50 psi., and propane-oil ratio dropping to 4:1. A temperature drop of 1.25 deg. per min. gives the best crystal for filtering.

A pressure drop valve closes the propane relief valve and opens the drain valve of the chiller. The next chiller, which is already charged, then starts its cycle.

Chilled oil is pumped to another surge tank which feeds a continuous supply to the filter. The rotary filter with vapor-tight shell separates the oil fraction from the crystallized stearin or other high-melt fraction.

Crystals collect on the filter drum, are washed with liquid propane to reduce liquid absorption of the surfaces. Scraped off the drum, crystals fall into a trough where the temperature is raised to dissolve the material in the propane. Then they go to a solvent recovery stripper where final amounts of propane are removed.

Oil fractions from the filter also have propane removed in a stripper before they are collected.

Propane used in the process is recovered almost completely for recycling. Consolidation of several unit operations in a single process like this results in considerable heat economy, one of the factors that led to the development of the process.

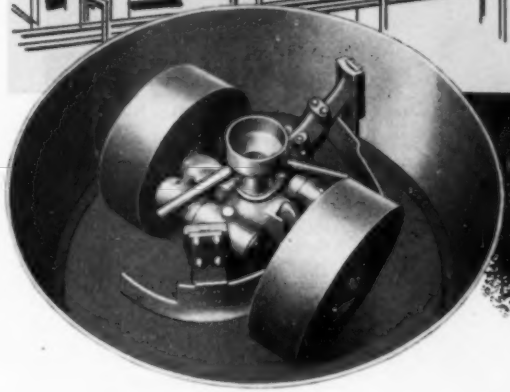
Shell Oil Will Double Capacity of Norco Refinery

Recent discoveries of sources of crude oil in Louisiana was one factor. The tremendous demand caused by mobilization was another. The two factors led Shell Oil Co. to put $30 million into modernizing and expanding its Norco, La., refinery.

According to an announcement last month, Shell will raise its daily capacity to 3.2 million gallons, almost a 50 percent boost.

Most important unit will be a large modern catalytic cracking plant. Expansion at Norco is part of a $100 million program that will add 4 million gallons a day to Shell's nationwide output.

HAVE YOU PROBLEMS IN PRODUCING *Catalysts?*



. . . then find out how

SIMPSON MIX-MULLERS

can increase production and improve your end product!

DO YOU REALLY KNOW WHAT MULLING IS . . . ?

Watch the practiced technique of a chemist's mortar and pestle—the intensive smearing and rubbing action—and basically, *THAT'S MULLING!*

Mulling with a Simpson Mix-Muller utilizes a special pair of revolving mullers and plows mounted on a stationary pan. The mullers are adjustable and are supported by rocker arms so that they can be free to ride on the material—creating a true mulling action as they revolve . . . eliminating balling and quickly developing maximum blending of the mix.

Simpson Mix-Mullers may be specially equipped for heating and cooling while mixing—for mulling under vacuum or pressure—for corrosive materials—or to function as a reaction vessel.

IT takes today's modern technology to profitably produce catalysts that are of uniform quality—that have excellent heat, steam and chemical stability. Speed and accuracy must be combined to assure a better end product at lower cost.

Increasing numbers of catalyst producers are finding that Simpson Mix-Mullers prepare their product much faster and more accurately than with any other method. There is no balling of materials. Blending is completely uniform. The mixing cycle is shorter for comparable results. That's because Simpson Mix-Mullers incorporate the true mulling principle of controlled mixing.

It's true with the production of catalysts . . . and it's true throughout the chemical process industries . . . today more Simpson Mix-Mullers are in use than ever before. If you prepare dry—semi-dry—or pasty materials—then consult a National Engineer or send for our latest catalog.

SIMPSON Mix-Muller® Division

NATIONAL ENGINEERING CO. 604 Machinery Hall Bldg., Chicago 6, Ill.

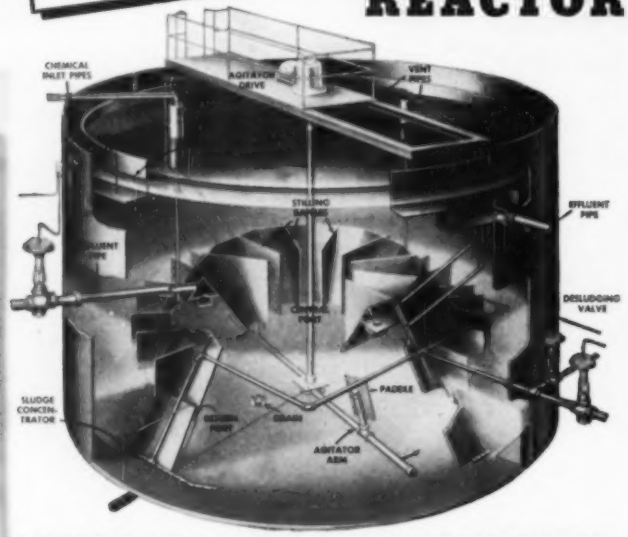
WATER CLARIFICATION
SOFTENING
DE-ALKALIZATION
REMOVAL OF SILICA FLUORIDES IRON & MANGANESE

by

COCHRANE-LIQUON

SLUDGE CONTACT

REACTOR

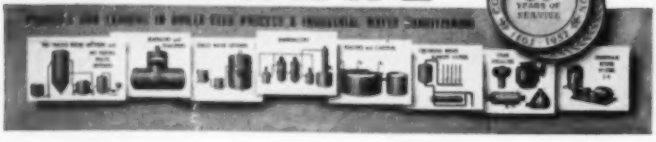


EMBODIES ALL 8 BASIC DESIGN REQUIREMENTS of the Sludge Contact Process

1. Two zones are provided; mixing zone below, clarifying zone above, separated by inclined baffles.
2. Raw water is uniformly distributed into mixing zone. Clarified water is collected evenly by a circular flume at the top periphery (plus radial flumes on larger diameter units).
3. Chemicals are introduced at the point where raw water enters, mixing chemicals, water and slurry simultaneously.
4. Variable speed agitator insures uniform, constantly agitated slurry mixture.
5. Slurry passes from mixing zone through ports in the baffles into the clarifying zone. A large central port plus a small peripheral port avoids conflict of rising water with the returning sludge from the clarifying to the mixing zone.
6. Slurry spreads out across full area of tank above crest of baffles, water rising slowly to separate from sludge.
7. Slurry spills over edge of baffles into sludge concentrator, settling and thickening and being withdrawn at intervals through diaphragm-operated valve.
8. Duration of desludging is controlled by timer. Automatic back-flushing of sludge collector pipe is also provided.

COCHRANE CORPORATION • 3113 N. 17th ST., PHILADELPHIA 32, PA.
In Canada: Canadian General Electric Co. Ltd. • In Mexico: Babcock & Wilcox de Mexico, S.A., Mexico City
In Europe: Recuperation Thermique & Epuration, Paris.

COCHRANE



Jellyfish in the Sky

A polyethylene balloon picks up its load of cosmic ray instruments and wisps into the air. The new General Mills balloon, used to explore the upper atmosphere, can lift a 300 lb. load 20 miles in the air. Properties of polyethylene give the balloon a low diffusion rate, allow little superheating with helium or other gases, and permit operations in temperatures from —40 to 120 deg. F. Recently 10,000 similar "jellyfish" balloons were floated from Germany with messages to people behind the Iron Curtain.

Benzene Hexachloride Output Will Be Adequate

About 125 million pounds of technical benzene hexachloride will be needed in 1952. In a recent meeting in Washington, the benzene hexachloride industry informed the National Production Authority they now have adequate facilities to produce that much.

Last year's production was 72 million pounds, but new production facilities enabled the industry to produce 80 million pounds in the first six months of this year.

NPA reported that the supply of raw materials, benzene and chlorine, appears to be adequate. NPA assured the industry it will help it obtain enough of these chemicals to meet the established production program.

Industry officials doubted whether enough drums and containers would be available for shipping their product. NPA stressed the need for conservation and re-use of drums where possible, but the officials said re-use is difficult. It is hard to get farmers to return the drums. They also said that

STARVATION DIET

This LaBour self-priming centrifugal pump in a midwestern chemical plant handles filtrates containing sulphuric and lactic acids. Operating conditions impose particular difficulties which demand the special ability of the LaBour.

There is no steady supply of liquid. The intake is frequently pumped dry, starving the system. Still, the LaBour Type DPL pump is on the job continuously, priming itself and picking up pressure the instant liquid is again at hand. It repeats this cycle with simple, trouble-free dependability as often as necessary.

Wherever you find the "impossible" jobs being done dependably and efficiently, you are likely to find a LaBour pump. Write for information today.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

a FLORIDIN DESICCANT

The high-pressure dehydration unit here illustrated is a property of the United Gas Pipe Line Company at Carthage, Texas. It represents the most advanced design, construction, and operating technique; and the drying agent employed is FLORITE DESICCANT. The Stone & Webster Engineering Corporation, who designed and constructed the plant, are users of FLORITE in various types of equipment, large and small, for oil and gas companies and for other branches of industry.

Natural gas, propane, butane, gasoline, air, nitrogen, carbon dioxide, refrigeration compounds, all are treated with superior drying efficiency by use of FLORITE. Selectively adsorbs 4 to 20% its weight of water—is regenerated by heating to 350°F. Write for literature, names of important users in your own field.

FLORIDIN COMPANY

Adsorbents . . . Desiccants . . . Diluents

DEPT. A. 220 LIBERTY ST., WARREN, PA.

there is danger of contamination in the re-use of drums.

Officials also asked the NPA to consider their request for materials needed to convert some facilities to production of benzene hexachloride with a higher active ingredient content and a lower inert ingredient content.

Tin Ore Tumbler

Rotating spherical digester or "ball boiler," which tumbles at the RFC tin smelter at Texas City, handles the HCl leaching of roasted tin ore. In operation, hydrochloric acid is added to its 8-16 ton charge of calcined tin concentrates, a slurry forms, then steam at 15 psi. is fed into the ball. After rotation at 1 rpm. for 12-16 hr., the charge is dumped. The residue is washed, dried and sent on for further processing. The tumbling digester, probably the only one of its kind in the U. S., has a welded steel shell lined with rubber and acidproof brick.

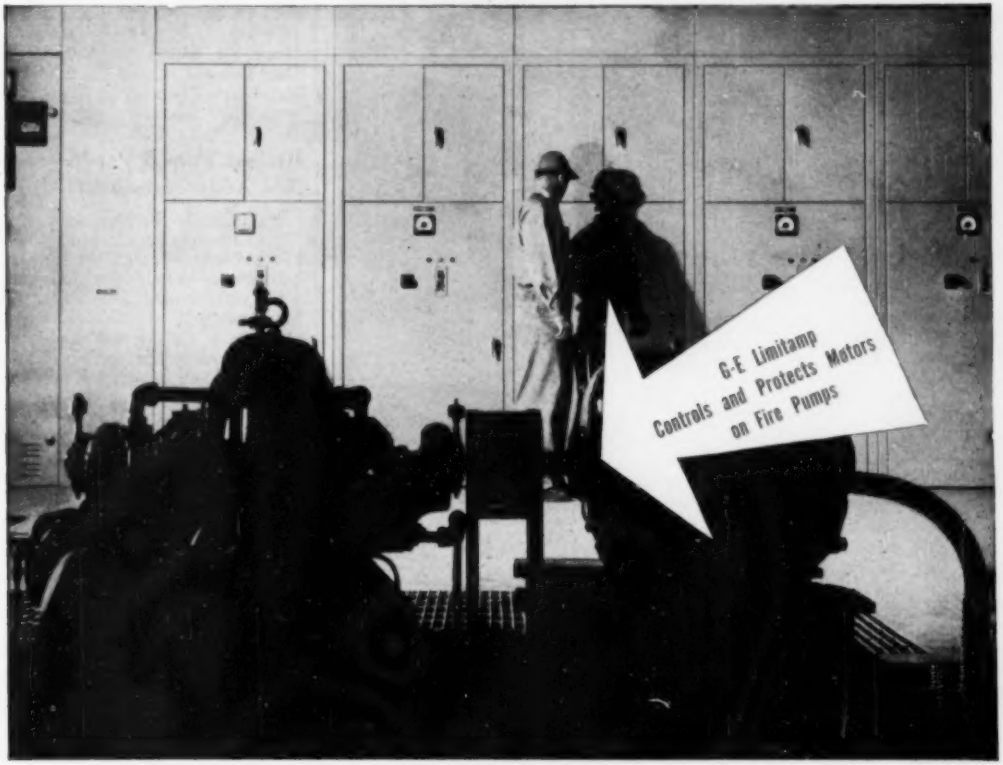
Bureau of Mines to Complete Experimental Alumina Plant

In the event of an aluminum shortage in an all-out war, the government intends to be prepared. During World War II they had the same intention:

Since bauxite ships had to run the submarine lanes, the Defense Plant Corporation started to build four experimental plants to recover alumina from anorthosite rock and other low grade aluminous ores. All but one plant was finished when the fighting halted, then building stopped. Last month, with war again a threat, negotiations were started to complete this plant at Laramie, Wyo.

Bureau of Mines received $350,000 to do the job. And an added $1 million was requested for operation in

TWO-WAY PROTECTION AT INTERNATIONAL



G-E Limitamp provides high-voltage control for five pump motors totalling pumping capacity of 17,000 gallons a minute at N. Y. International Airport

This fast-acting control is expected to put motors of 210 and 350 horsepower into immediate action in case of fire at the airport. Designed for heavy duty; corrosion resistant, and containing no complicated mechanism, Limitamp requires only routine maintenance—is always ready to go into operation.

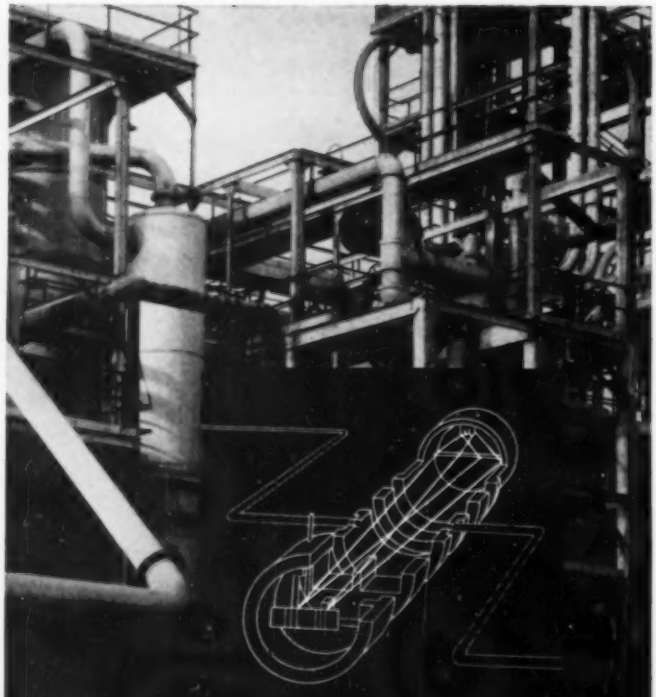
Chosen for its high interrupting capacity and comparatively low cost, pre-engineered and factory assembled G-E Limitamp guards equipment against the ravages of short-circuit currents. G-E developed EJ-2 fuses interrupt the circuit within ¼ cycle. This prevents expensive, and possibly dangerous shutdowns.

New compact design of controllers, many protection features, co-ordinated engineering on every job make this the high-voltage control (up to 4800 volts) you need for economy and protection. Write today for Bulletin GEA-5409A.

General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

730-28



IN STYGIAN DARKNESS
THE SHADOW OF A VAPOR
THINKS FOR A GIANT

Infrared shadows, cast by gaseous gases in the sealed cells of a lightless chamber, permit critical concentrations of a gaseous component to be recorded and to control industrial processes through the Baird Associates Plant Stream Analyzer.

This sensitive, accurate, reliable instrument has proved its worth in control applications involving: n-Butane in methane, ethane, propane, iso-butane, CO, and CO_2; methane in natural and manufactured gas blends; carbon dioxide in expired air; acetylene in 14-component mixture; methane in 14-component mixture; carbon dioxide in 7-component mixture; hydrogen cyanide in 8-component mixture; ammonia in 7-component mixture; acetone in air; acetylene in hydrogen cyanide.

Your process control may benefit by use of the Baird Associates Plant Stream Analyzer. Bulletin 36 gives detailed information; ask us about the use of this instrument in your control problems.

Baird Associates, Inc.
INDUSTRIAL PHYSICISTS
33 UNIVERSITY ROAD CAMBRIDGE 38, MASS.

1953. Sponsoring the appropriation is Senator O'Mahoney (D., Wyo.).

Who'll eventually run the plant? Custody is the Department of Interior's for the next two years, three if necessary. Talks are going on now between the Bureau of Mines, RFC, Dorr Co. and others. Plans for the operation will be made at these discussions.

Hudson Pulp & Paper Builds New Addition to Kraft Mill

Expansion of the paper industry in the South continues. Last month the Hudson Pulp & Paper Corp. had Governor Fuller Warren over to dedicate a $10 million addition to its Palatka, Fla., kraft mill.

The new addition will double the plant's capacity and permit flexible output. It will boost total daily production to 400 tons of finished, unbleached kraft. About 85 percent of the kraft will be converted to Kraft wrapping, butchers paper, gummed sealing tape, grocery bags and sacks, and multi-walled bags for industrial products.

Chief feature is a 234-in. electronically-controlled and dynamically balanced Pusey & Jones paper machine. Rated speed is 2,000 ft. per min.

Other facilities include a new water treating plant with a capacity of 12 million gallons per day; a doubled wood yard and wood room; five new 10-ton digesters, with a separate gassing-off system for turpentine recovery; three new countercurrent brown stock washers and deknotters.

Roosevelt Oil Putting Up Benzene-Toluene Units

Construction of three new units—a platforming, catalytic and special extraction unit—at the Roosevelt Oil & Refining Corp. in Mt. Pleasant, Mich., is now under way.

Although designed primarily to produce benzene and toluene, the new units will have a capacity high enough for the processing of gasoline. The three units will produce 3 million gallons of benzene and 3¼ million gallons of toluene per year.

The platformer will take in narrow boiling range (150-220 deg.) cuts, derived from desulphurized straight run crude oil stocks. The catalytic unit will use aromatic charge stocks, and saturate them by hydrogenation over platforming catalysts.

The extraction, or Udex, unit developed by Dow Chemical will selectively extract aromatics produced by the first two units.

NEED ALKALIES?

Call Solvay First

Because Solvay gives you the dependable quality and uniformity of America's oldest and largest producer of alkalies.

Because Solvay can give you delivery service from strategically-located major plants and over 200 local stock points.

Because Solvay offers you a Technical Service that is operated on an Industry-Wise basis . . . providing expert advice to individual industries.

Because Solvay sales service is handled by a staff of thoroughly trained, helpful salesmen operating from thirteen convenient branch sales offices . . . plus a nation-wide organization of selected jobbers, distributors and dealers.

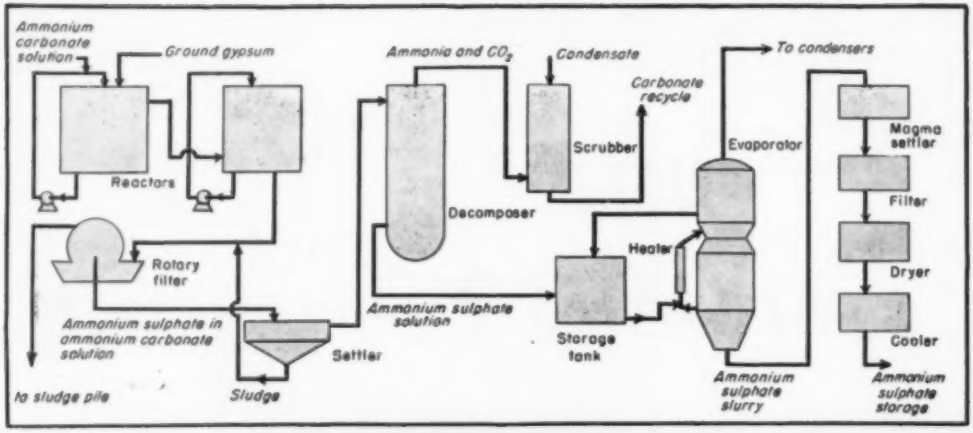
SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

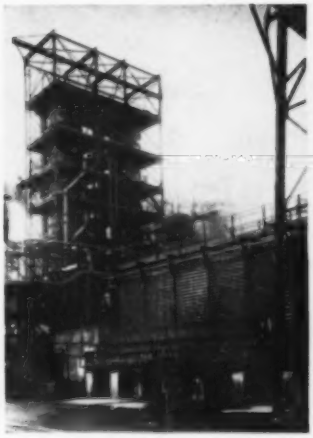
BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • St. Louis • Syracuse

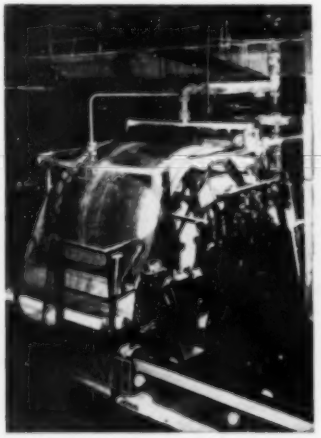
SOLVAY
Alkalies Chemicals
Since 1881

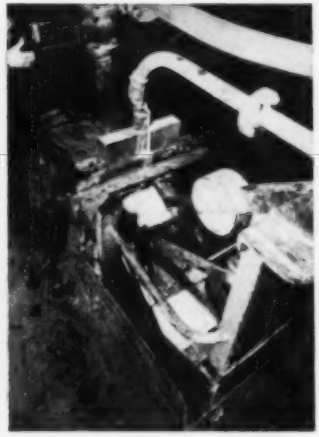
SODA ASH
Caustic Potash
Chlorine
Potassium Carbonate
Calcium Chloride
Sodium Bicarbonate
Specialty Cleansers
Sodium Nitrite

CAUSTIC SODA
Nytron
Ammonium Bicarbonate
Para-dichlorobenzene
Ortho-dichlorobenzene
Monochlorobenzene
Methanol
Formaldehyde
Ammonium Chloride









Ammonium carbonate towers, chalk filters and salt filters in British counterpart of Indian plant.

Shortage Glamorizes Gypsum

India's new ammonium sulphate plant forecasts a bigger role for gypsum in relieving the world sulphur squeeze. It might even have a future in the U. S. economy.

Nudged by the sulphur shortage, American manufacturers have recently been showing interest in gypsum as a raw material for ammonium sulphate. A brand new government plant built by Chemical Construction Co. in Sindri, India, gives them a live model to study.

►**Phillips' Plans**—Meanwhile, Phillips Chemical Co. in Houston has been playing with the idea of making ammonium sulphate from ammonium carbonate and the calcium sulphate sludge of nearby triple superphosphate plants. Completed plans for a plant are now in the hands of the parent company, Phillips Petroleum, awaiting possible approval.

The Indian plant, meanwhile, is already operating at a third of its target capacity of 1,000 tons a day. Full production will be reached by mid-year.

Ammonium sulphate is made by reacting ammonium carbonate (ammonia, carbon dioxide) with calcium sulphate. Gypsum is mined in the south of India and brought to Sindri by rail. Estimated consumption: 536,000 tons a year.

Ammonia is synthesized from coke at the plant site by the semi-water gas process. Coke is consumed at a rate of 178,000 tons a year to produce 33 million cubic feet a day of raw gas. The ammonia plant provides the large volumes of low-cost carbon dioxide necessary for the economic survival of the process.

►**Problems Crop Up**—It's during the reaction between ammonium carbonate solution and the gypsum that real chemical engineering problems crop up. Carbonated liquor, reeking of ammonia, must be brought into intimate contact with the gypsum. And it must be kept there at a suitable temperature until the reaction has gone as far as possible so as not to waste calcium sulphate.

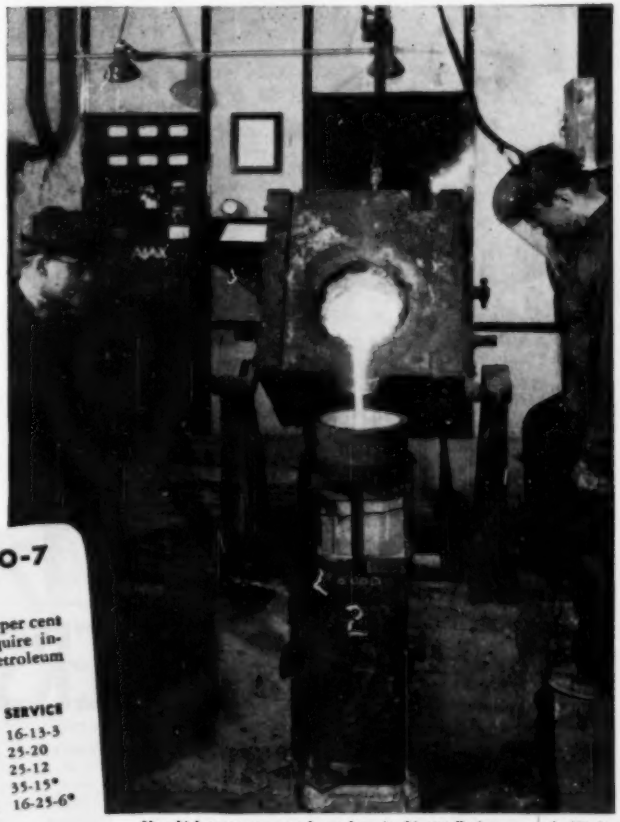
Since the reaction is reversible, ammonia and carbon dioxide must be

To get the best life/cost ratio for your tubes: Ask the experts!

FINDING several steels that solve your heat, pressure, corrosion and oxidation problems isn't too difficult. But there's only *one* steel that gives you maximum tube life per dollar—the best life/cost ratio.

The Timken Company metallurgists—recognized authorities on high temperature steel—can help you find the one steel that gives you the most for your tube dollar. They are backed by more than 20 years of steel development and have 23 different analyses from which to choose. And whichever of the 23 analyses solves your problem you can be certain of uniform quality. The Timken Company carefully controls quality from melt shop through final inspection.

Our "RSQ"—Research, Supply, Quality—can solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



New high temperature steels are born in this 300 lb. furnace at the Timken Company. After our metallurgists formulate the analysis, an experimental heat is made. Tests indicate whether the proposed steel is worthy of further investigation.

This month's report is on: **SICROMO-7**

Suggested as a substitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

23 TIMKEN® STEELS FOR HIGH TEMPERATURE SERVICE

Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20
DM-2	2¼% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

*Not available as seamless tubing at the present time.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN

Fine Alloy

STEEL

and Seamless Tubes

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

SPARKLER FILTERS • SPARKLER FILTERS

You Get 2 in 1

WITH

SPARKLER FILTERS

Only Sparkler horizontal plate design gives you the equivalent of *two* standard filters in just *one* tank.

By keeping a spare cartridge of plates ready at all times your filter need never be shut down for longer than it takes to hose down the tank and exchange the cartridge of dirty filter plates for a cartridge that is freshly dressed. This not only speeds the return of the filter to full production duty but also makes it easy for the filter operator to clean the plates whenever and wherever it is most convenient.

Besides eliminating the need for a standby filter, a spare Sparkler cartridge minimizes downtime, cuts labor costs, and makes your entire filtering operation a simple job that can be handled by just one man.

Write Mr. Eric Anderson for full information or engineering assistance

Manufacturers of industrial filtration equipment for more than a quarter of a century

SPARKLER MANUFACTURING CO.
Mundelein, Illinois

Sparkler International Corp.
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U.S.A.

SPARKLER FILTERS • SPARKLER FILTERS

kept in excess. A series of reaction vessels is used to prevent incoming liquor, strong in ammonium carbonate, from becoming immediately diluted with liquor containing hardly any.

A compromise must be reached in grinding the gypsum. It must be fine enough for the solution to attack it. However, the next stage in the process is to filter the liquor. So the gypsum is kept reasonably coarse and the reaction continued somewhat longer to insure a calcium carbonate mud which can be easily filtered off.

Each reaction vessel has its own stirrer. Any interruption in agitation means sedimentation and digging out of a strongly ammoniacal mud.

Heating is by steam coils. Provided the temperature is kept at 70 deg. C. and all the foregoing precautions are attended to, the reaction is smoothly completed in 5 hr.

Precipitated calcium carbonate is filtered from the reaction mixture with rotary vacuum filters. The solution is then heated in a salting type evaporator to remove excess ammonium carbonate. The solution is particularly corrosive at this stage; equipment which contacts it must be of lead-lined or chrome-nickel steels. Finished product in the form of sulphate of ammonia crystals is taken to a weighing and bagging plant.

This process was licensed to the Indian plant by Imperial Chemical Industries. They have been using it successfully in Prudhoe, England, since World War II.

News Briefs

Chlorine: Arvey Corp. will spend $2 million on expansion program. It will double chlorine-caustic output at its Memphis plant. Production will be used by Velsicol Corp. in the manufacture of heptachlor, a new insecticide.

Carotene: Barnett Laboratories of Long Beach, Calif., are now making carotene in a converted plant in Soledad. Barnett can now process 50 tons of carrots daily in its three plants. Most of the increased production will go to the margarine industry.

Farm chemicals: Monsanto will build an experimental farm in the St. Louis area. It will test various fungicides, herbicides, insecticides, defoliants and plant foods.

Petroleum: General Petroleum Corp. will put $500,000 worth of im-

provements into its Torrance, Calif., refinery. It will increase production of aviation fuel components. Key piece of equipment is a giant distillation tower, 10 ft. in diameter, 157 ft. high. It was originally scheduled to be shipped to Russia under Lend-Lease.

Uranium: New discoveries of uranium have been made in the San Juan Mountains of southwestern Colorado. None of the finds have immediate commercial value. They are important because they open up a new area as a potential source of radioactive material.

Chlorine products: Stauffer Chemical Co. has received approval from NPA to build a chloride products plant in Louisville, Ky. Most of the output will be consumed locally. Hydrogen chloride will go into neoprene synthetic rubber, and carbon tetrachloride into Freon and aerosols.

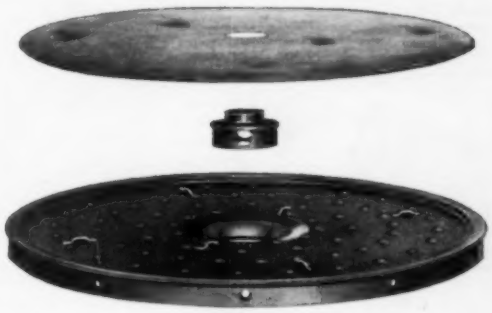
Resins: The Chemical Division of Goodyear Tire & Rubber Co. will step up production of Pliolite S-5, a styrene-butadiene copolymer. Increased qualities of unmilled material will be available this month, while milled resins and pigmented-base output will rise in January. Demand by the paint industry has increased some 400 percent in the past three years.

Rubber: Boston Woven Hose and Rubber Co., Cambridge, Mass., has broken ground on a new $1 million rubber reclaiming plant. The plant, which will use an air separation process will be completed next spring. The entire output will go into the company's own manufacturing operations.

Cat Crackers: The new 60,000-bbl.-per-day fluid catalytic cracker at the Port Arthur, Tex., refinery of the Gulf Oil Corp. is the largest of its kind ever built. It will turn out high octane gasoline, fuel oil and chemicals for synthetic rubber.

Rubber Technology: The Los Angeles Rubber Group, Inc., recently established the Thargi Rubber Technology Foundation at the University of Southern California. The foundation will provide funds for USC's school of engineering. Facilities in the department of Chemical engineering and courses in rubber technology will be expanded. The school will train engineers for more than 150 rubber manufacturing plants in the area. —*End*

SPARKLER FILTERS • SPARKLER FILTERS



SPARKLER FILTERS • SPARKLER FILTERS • SPARKLER FILTERS

SPARKLER FILTERS • SPARKLER FILTERS

You Get

Complete sanitation with

SPARKLER FILTERS

The illustration above shows at a glance why Sparkler Filters are the most sanitary, most efficient filters ever designed.

Starting with the basic part of any filter — the filter element — Sparkler design makes every surface easily accessible for thorough cleaning. The few simple parts in the photo represent a complete Sparkler horizontal filter plate, with no cracks, crevices, or hard-to-reach parts that can imperil product purity by retaining objectionable material.

Once the cartridge of plates is removed from the filter, disassembly is quick and easy. Just loosen the tie-rods and the plates come apart in 1 - 2 - 3 order. Lift the paper off, remove the perforated metal wafer, then remove the supporting plates. One man does the entire job in a matter of minutes.

Inside the tank, too, complete sanitation has been provided for. All surfaces are smooth, and all joints are rounded off for accessibility and thorough cleaning.

When you need absolute product purity, you are safest with Sparkler.

Write Mr. Eric Anderson for full information or engineering assistance

SPARKLER MANUFACTURING CO.
Mundelein, Illinois

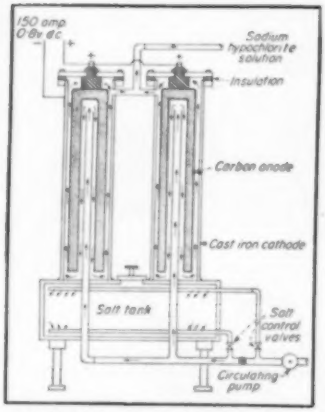
Sparkler International Corp.
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U.S.A.

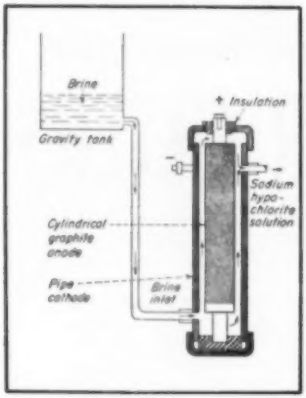
World's largest manufacturers of horizontal plate filters . . .

SPARKLER FILTERS • SPARKLER FILTERS

Readers' Views & Comments



NEGUS designs his cell like this, but . . .



AGUILERA suggests this design instead.

More on the Negus Cell

Sir:

In reading your November issue, my attention was called to the article about the Negus hypochlorite cell (p. 252). As I have had some experience in electrochemistry I am sending some suggestions that can be of interest for making, not a better cell, but perhaps a simpler and cheaper one.

Instead of using a hollow cup-shaped anode, why not use a standard cylindrical anode (see cut) such as put out by International and National Graphite Electrode Corp?

For the cathode, why not use any standard pipe one inch bigger in diameter than the anode, closed at the bottom with a cap and fitted with a bored cap in the upper end to receive the anode insulator? Leave a vent for the hydrogen gas.

Instead of using a closed vessel to allow pumping the solution through the cell, I think it should be better to use gravity flow with low pressure to have a steady flow in the cell and a diffusion zone around the anode to reduce discharge of ClO^-. The brine inlet can be located in the bottom tangentially (0.5 in. pipe) and the outlet in the upper part (0.75 or 1.0 in. pipe).

Current density in the anode can be from 30 to 50 amp. per sq. ft. Flow through the cell should be regulated so as to have an effluent temperature below 45 deg. C. Above that, hypochlorite goes to chlorate. We have used graphite anodes in steel pipes for protecting them cathodically against corrosion of the brines we use in making chlorates.

I hope this may be of some use to Frank Negus. . . .

ARMANDO PEREZ AGUILERA
Chemical Engineer
Mexico City, Mexico

▶ *We're passing along this letter to our readers as well as to Frank Negus for two reasons: (1) we believe the suggestions will interest those who noticed our November announcement on the Negus hypochlorite cell; (2) it illustrates something we believe is all too rare among chemical engineers—the passing along of tips and comments simply from the desire to help a fellow engineer solve his problems or do a better job.*

Appropriate to the spirit in which it was written, Sr. Aguilera's letter arrived just before Christmas.—ED.

Yes, Much In Common

Sir:

I read your article, "Engineers: Much in Common?" in *Chemical Engineering* for November (p. 309) with a great deal of interest. It was surprising to me that by questioning a large group the investigators could reach conclusions which seemed to fit individuals among the many engineers I have known so well.

Perhaps the general rules set forth impressed me particularly because I have been working almost exclusively with lawyers during the last six or seven years, during which time I have been in the practice of patent law. Often I have had occasion to examine myself and have come to the conclusion that I differ from lawyers generally along the lines discussed in your article.

In fact, I was so impressed with your article that I showed it to my wife who agreed that it seemed to be a description of me.

Since your conclusions fit me so well, I agree that by and large engineers are very desirable citizens. However, I do feel that they tend to lose their individuality, probably because they are in contact almost exclusively with other engineers.

Anyway, it's good to know that my shortcomings aren't mine alone even if I can't take full credit for what virtues I may have.

PAUL L. TILLSON
Semmes, Keegin, Robinson & Semmes
Washington, D. C.

▶ *It's interesting that Reader Tillson found he and most of his engineer acquaintances fitted so well into the "pattern of engineers" we described in November—both virtues and shortcomings.*

So far, no reader has complained that the pattern might not reflect an accurate picture of chemical engineers. A psychologist would probably say this has a deep significance.—ED.

Chilton's Agglomeration

Sir:

I was pleased with your October report on "Agglomeration." A great deal of data, well presented. The cost figures are a welcome addition to the published information on this general subject.

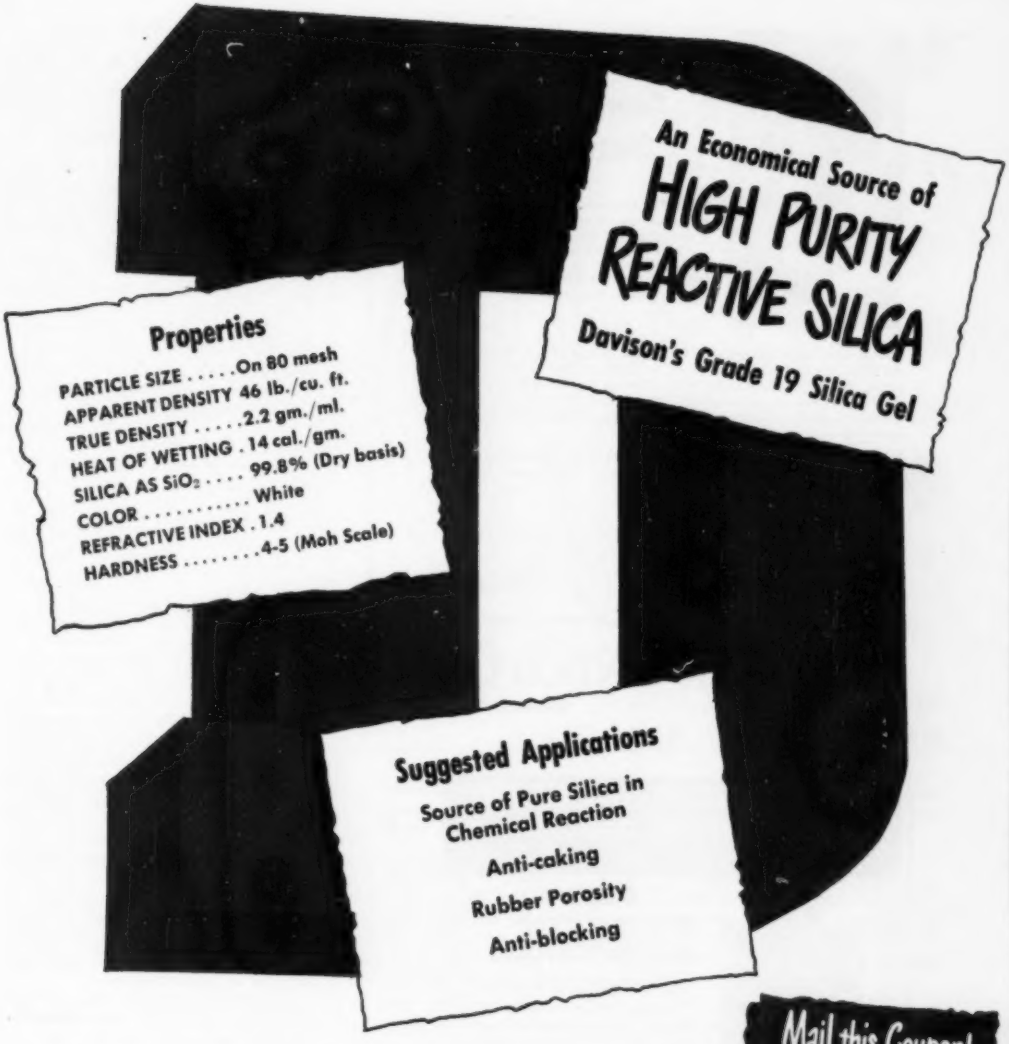
Have you, or do you anticipate, similar reports on fine grinding or on drying?

C. E. LESHER
Pittsburgh, Pa.

▶ *Yes. Watch for a comprehensive report soon on "Size Reduction."*

The 14-page report on agglomeration (Oct., pp. 161-174) was the work of Associate Editor Cecil Chilton. He said recently, after returning from the AIChE meeting in Atlantic City:

"There was a lot of talk about unit operations bursting at the seams. But agglomeration certainly doesn't impress me as having outgrown its pants. There has been very little real engineering information published on it, and I feel that the development of its


An Economical Source of
HIGH PURITY
REACTIVE SILICA
Davison's Grade 19 Silica Gel
Properties
PARTICLE SIZE . . . . . On 80 mesh
APPARENT DENSITY 46 lb./cu. ft.
TRUE DENSITY . . . . . 2.2 gm./ml.
HEAT OF WETTING . 14 cal./gm.
SILICA AS SiO_2 . . . . 99.8% (Dry basis)
COLOR . . . . . White
REFRACTIVE INDEX . 1.4
HARDNESS . . . . . 4-5 (Moh Scale)
Suggested Applications
Source of Pure Silica in Chemical Reaction
Anti-caking
Rubber Porosity
Anti-blocking

Davison Grade 19 Silica Gel is an amorphous, extremely porous form of silica. It is odorless, a non-conductor of electricity and has a high adsorptive capacity for gases and liquids.

Davison silica gel can be produced in many variations to assure maximum efficiency in your particular application.

Send the coupon for further information and prices on Davison Grade 19 Silica Gel . . . four-page folder giving chemical and physical properties and suggested applications on all dependable Davison products.

Progress through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Mail this Coupon!

THE DAVISON CHEMICAL CORPORATION
INDUSTRIAL CHEMICAL DIVISION
BALTIMORE 3, MD.

☐ Please send me information and prices on Davison Grade 19 Silica Gel

☐ Four-page folder on dependable Davison products

NAME.....

TITLE.....

FIRM.....

ADDRESS.....

CITY.....

ZONE.....STATE.....

Bulletin 8210

General Purpose Control Valves

★ Full Port Area—Pocketless
★ For Air, Gas, Water, Brine, Freon, Methyl Chloride, Light Oil and other Liquids and Gases up to 212°F; Pressures up to 400 pounds
★ Several Auxiliary Variations
★ Several Sizes: ⅛ to 2½ Inches

Our Bulletin 8210 Solenoid Valves are designed for those shut-off requirements where a simple, rugged, automatic control will serve. They close instantly when current to the coil is cut off. Full line pressure on top of the valve piston aided by a powerful spring assures tight closing. They reopen fully when the coil energy is restored.

Bulletin 8211 Valves are similar except that they have Explosion-Proof Solenoids approved by Underwriters' Inc., Class 1, Group D, Hazardous Location.

ASCO Solenoid VALVES

If you have any automatic control problems that fit into the above class, study fully the merits of Asco Bulletin 8210 and 8211 Solenoid Valves. Write us anyway, regardless of your problems, because we have many other types of solenoid valves.

When in need of Electromagnetic Controls, come to us.

Automatic Switch Co.

381 Lakeside Avenue • Orange, N. J.

SMOOTH, SENSITIVE, TROUBLE-FREE and EXPLOSION-PROOF, too!

EBERT PLUNGER TYPE MERCURY RELAYS

Expanded production facilities have enabled us to maintain NORMAL DELIVERY SCHEDULES on these heavy duty relays handling up to 60 amperes.

EBERT MERCURY RELAYS are now available in single, 2-pole and 3-pole structures. Send for latest catalogue, Dept. CE.

Hermetically sealed glass construction eliminates failure due to dust, moisture, oxidation... No contact points to burn, pit or stick... The liquid mercury-to-mercury contact provides years of positive, noise-free action... without servicing or maintenance costs!

EBERT ELECTRONICS CO.
185-09 Jamaica Ave., Hollis, L. I., N. Y.

READERS' VIEWS, cont. . .

theory and principles is still largely virgin territory."—ED.

Agglomeration (Sintering)

Sir:

I found your October report on "Agglomeration" very interesting. I think you did a good piece of work in putting this report together.

The picture on p. 172 of the batch sintering operation using a stationary hearth interests me. Can you tell me where I can get some information about this particular operation? I am familiar with batch-type sintering equipment of the Greenwalt type, but this is something else.

E. W. DAVIS
Institute of Technology
University of Minnesota
Minneapolis, Minn.

▶*The batch sintering machine referred to is made by the Mace Co., 2763 Blake St., Denver 5.*—ED.

Agglomeration (Catalysts)

Sir:

Many thanks for the reprint covering your report on "Agglomeration." . . . I feel that you have turned out a very excellent summary of this field and one which serves a very useful purpose. I believe that *Chemical Engineering* has done an excellent job of surveying these fields and bringing them up to date.

If I had any suggestion with respect to omissions from the report, it would be on the preparation of microspherical particles, such as used in the production of aluminum silicate catalyst; this is quite possibly a technique which would not fall under the heading of agglomeration.

I might also say that I was particularly impressed by the amount of data on costs and also production capacity of different kinds of units. I know just how hard it is to get this type of information, and most articles are sadly lacking along these lines.

A. C. BYRNS
Director of Research
Chemical Division
Kaiser Aluminum & Chemical Corp.
Oakland, Calif.

▶*We considered spray technology, finally decided against including it in our November agglomeration report (but it would have been just as logical to have included it).*

Besides, the technology of making microspheroidal catalysts was covered in our December 1951 report on "Catalysts" (p. 157) as well as by a technical news item in the same issue

(p. 224) on American Cyanamid's new plant. In addition, our November pictured flowsheet (pp. 218-222) was on Davison Chemical's microspheroidal catalyst plant at Cincinnati.—Ed.

One Way to Figure Maintenance

Sir:

I appreciate very much your article by Chilton "Cost Estimating Simplified" in your June issue . . .

Could you tell me, from your experience, what might be a good figure for maintenance (as man-hours of labor) in a chemical plant making organic intermediates and dyestuffs?

Alberto Tamburini
General Manager
Aziende Colori Nazionali Affini
Milan, Italy.

▶We don't have an actual maintenance figure for a dyestuffs plant. But we have published information that makes it easy to approximate maintenance man-hours in a dyestuffs or almost any other type of chemical plant. Here it is:

(1) Take the process labor requirements, as manhours of direct operating labor per ton of product, from our chart of February 1951; (2) multiply by the productive capacity of the plant to get a good guess on the size of the operating crew; (3) take the capital investment, as dollars per ton of product, from our chart of May 1951; (4) apply your own maintenance figure against this investment to approximate the annual plant maintenance cost; (5) multiply by a factor of 0.50-0.65, as pointed out in our article of June 1951.

This approach should give you a fairly good idea of the maintenance crew, man-hours or labor costs for any typical chemical plant.—Ed.

Titanium Roundup

Sir:

I have studied your November article, "Titanium—1951", very carefully, and am delighted with the interest displayed by *Chemical Engineering* in this new metal which is expected to have such a profound influence upon the quality and efficiency of future Ordnance material.

Your article very adequately brings the reader up-to-date, and you are to be congratulated "for a job well-done."

B. S. Mesick
Colonel
Ordnance Department
Watertown Arsenal
Watertown, Mass.

▶News editor O'Connor started out to do a "short news item on what's

Custom Built
STAINLESS STEEL
EQUIPMENT....
...is ONLY AS GOOD AS
ITS FABRICATOR
From the minute you decide on a made-to-order stainless steel vessel, you're in the hands of a fabricator. In fact the selection of your fabricator is generally one of your big problems.
It's more than a question of following blueprints. Stainless steel is a difficult alloy to work. It "acts up" during fabrication. In cutting, forming, welding and even in finishing, your fabricator must know how to guard the corrosion resistance and strength of the alloy. His plant must be specially equipped for working with stainless steel. The longer his experience, the more help he'll give you in building vessels that meet your requirements.
We work exclusively with stainless steel and alloys. Our plant is specially tooled to fabricate this metal. Our engineers and mechanics are particularly trained for the work. Why not consult us when you plan your next stainless steel vessel?
S. BLICKMAN, INC. • GREGORY AVENUE • WEEHAWKEN, N. J.
S. BLICKMAN, INC.
Guards Alloys in Fabrication
SEND FOR THIS VALUABLE BOOK
A request on your letterhead will bring our guide, "What to Look For When You Specify Stainless Steel for Your Processing Equipment."
CORROSION RESISTANT PROCESSING EQUIPMENT
TANKS • KETTLES • STILLS • HEAT EXCHANGERS • AGITATORS • MIXERS • TOWERS • PIPING

THE RIGHT CHLORINE GAS FEEDER FOR YOUR PLANT . . .

It's BUILDERS Visible Flow CHLORINIZER Model HCVS —the *modern* feeder for chlorinating cooling water to condensers and heat exchangers.

Model HCVS is *the* up-to-date feeder from every point of view:

LOOK AT IT from the angle of *dependability* and you'll find a design that assures long life and low maintenance. This feeder handles chlorine gas in the dry, non-corrosive state. Double-durability is assured by the materials used in the chlorine flow system, all able to withstand even corrosive moist chlorine. Vital control parts are extremely simple and free from mechanisms which need frequent attention. Foolproof protective devices assure absolutely safe operation under all conditions.

LOOK AT IT from the *operating* point of view and you'll find equally important advantages: a Sightflo indicator that gives you a true picture of actual flow (accurate within ± 4%) —a dependable system for controlling the rate of chlorine feed by varying water or air pressure — unitized construction that can be easily understood by any competent mechanic.

LOOK AT IT from the *adaptability* angle. No other chlorine feeder is so easy to change for capacity or for type of control. Model HCVS is ready-built for proportional control; for start-stop operation; or for multiple control for dosing several points with the same feeder, simultaneously or in sequence. It holds its vacuum . . . resumes chlorine feed instantly at the start of each dosing period.

BUILDERS Visible Flow CHLORINIZERS are available in three volumetric models — for any chlorination service:

Up to 400 lbs./day	Model DVSX	Bulletin 840-F2A
Up to 2000 lbs./day	Model CVS	Bulletin 840-F1
Up to 6000 lbs./day	Model HCVS	Bulletin 840-G27

For Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 369 Harris Ave., Providence 1, R. I.

BUILDERS PROVIDENCE Instruments

THE INDUSTRIES FOR BUILDERS

happening in titanium," dug so diligently and found so much happening that he came up with a 4-page feature article instead. It took three months of digging to pull all the facts together.—ED.

What Payoff Time for Engineers?

Sir:

Referring to your editorial in *Chemical Engineering* for November I would like to offer a few points for your consideration:

Who is to say that the starting salaries being offered to "youngsters" today are unwarranted?

Consider their investment in time and money once again. Taking the cash investment as $1,000-$1,500 per year and the net wages not earned as an average of $2,500-$3,000 per year, we have a total capital investment of $16,000 for a B.S. degree, $20,000+ for an M.S., and $28,000-$32,000 for a Ph.D.

If we desire a reasonable payoff time of ten years (most chemical companies demand a much shorter time, you know, even on "sure things"), the average B.S. would perforce earn $1,600 per year more than he would have earned as less lettered but more "unioned" labor. I have very serious doubts that most of them will even equal the excellent wages enjoyed by carpenters, plumbers, electricians, etc., in their first ten years after degree. Correspondingly larger amounts would be required by Mr. M.S. and Dr. Ph.D.

As for performance or experience failing to warrant any particular salary, how are we to measure?

If in spite of management's overpowering representation in all of our professional societies, the salaries of new engineers are at last beginning to take on some semblance of the reasonable, let us cheer the law of supply and demand! I hope the shortage will obtain long enough so that I (as a Ch.E. with six years industrial experience) may perhaps approach in salary what I would be making as a poor downtrodden plumber of comparable experience.

I would even like to get a bit above his mark soon so as to arrive at the "payoff" point before retirement.

NAME WITHHELD

Kirkwood, Mo.

► *Our statement that pulled this protest: ". . . such competition (between chemical companies and government) for research workers is good for no one, least of all the youngsters who will get much bigger salaries than*

OIL-FREE COMPRESSORS

VACUUM PUMPS and BOOSTERS

Right above: Five JOY WNO-112 Oil-Free Compressors for pressure-testing of food containers, oil-free ejection of metal stampings, paint spraying and general oil-free processing service.

Left foreground: Three JOY WGV-9 Vacuum Pumps handle the job of vacuum feeding of metal sheets.

Left background: These three JOY WGB-9's boost gas pressure for the burners in the soldering process.

WSD 1-4019

giving highly satisfactory service in a large Midwestern Can Factory

For dependable *oil-free* air, day in and day out—as you may need it for any chemical processing or other special operation, or on that exacting instrument control job—there's a JOY OIL-FREE Compressor to meet your particular requirements. Dual Cushion valves, surface-hardened wearing areas and replaceable wearing parts are some of the exclusive JOY design features, and there's a complete line from 163 to 8800 CFM at pressures up to 100 PSI. A complete line of standard Compressors, Vacuum Pumps and Booster Compressors, too, for many different needs. Write for complete information, or . . .

Consult a Joy Engineer

Over 100 Years of Engineering Leadership

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY SULLIVAN OF CANADA, LIMITED, GALT, ONTARIO

"Colmonoy hard faced pump rods last 22 times longer"

Reports a Plant Engineer

His Problem: In handling highly abrasive material in acid sludge pumps, pump rods (1⅛" x 28" long) had to be repacked every eight hours, and completely replaced every twenty-four hours. Cost of replacement part alone: $45.00.

His Solution: He tried *Spraywelding** a few discarded rods with *Colmonoy No. 6*, an extremely wear and corrosion resistant hard-facing alloy. He then found that the packing lasted sixty hours, almost eight times as long as before (Colmonoy No. 6 has a very low coefficient of friction), and that the average Spraywelded rod didn't require replacement until working 573 hours, better than 22 times the life of a new rod.

Not only did the hard-faced pump rod outlast a new one many times over, but it cost less than half as much as a new rod to start with. Added to this were the impressive savings found in reduced maintenance labor, and in less lay-up time of the pump.

Colmonoy stands for a complete line of hard-facing alloys. Only a complete line can meet the various challenges of impact, abrasion, and corrosion, either singly or in combination. Colmonoy alloys come in forms to suit many applications: rod, paste, powder, wire, and castings.

Write for general literature or tell us of your particular problem for more detailed information.

The Spraywelder, shown spraying a pump rod used in handling caustic solutions.

Branches: Long Island City, Buffalo, Chicago, Houston, Los Angeles, Montreal

ORDER FROM YOUR LOCAL JOBBER

WALL COLMONOY

CORPORATION

HARD FACING ALLOYS

DETROIT

*Spraywelding is a Colmonoy hard-facing process. It combines metallizing and welding. A powdered Colmonoy alloy is sprayed on the worn part, using a powder metallizing gun called the Spraywelder. The overlay is then fused, or welded to the part with a standard acetylene torch.

Spraywelding has these advantages:

Less material is used because the thickness of the overlay is easily controlled to within .010"

Less time is required to spray than to handweld, and because of the accuracy of spraying, less time is required to finish the part.

A Spraywelded surface is free of pinholes; no patching or discards. Part distortion is held to a minimum.

Write us for the name of the nearest Spraywelding shop or for information about equipping your plant for Sprayweld work.

their experience or performance will warrant."

Whether you agree or disagree with this statement probably depends to a large extent upon your own age: we find most young engineers don't, most older ones (non-management) do. —ED.

Right Man, Wrong Pew

Sir:

Our news release about Dr. William A. James was specific in stating that his appointment was to the research staff of Dearborn Chemical Co., Ltd., Toronto.

Your story (Nov., p. 326) has brought rather interesting but unfortunate repercussions from our Chicago laboratory staff.

EARL J. GORIS
Dearborn Chemical Co.
Chicago, Ill.

► *Dr. James is director of research for Dearborn's Canadian subsidiary, not of the firm's Chicago laboratory as we stated.*—ED. End

---

MEMO FROM THE EDITOR

(Continued from page 137)

---

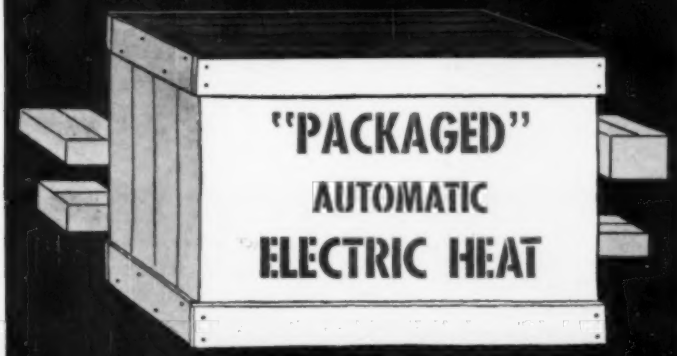
on top secret war inks) Frances decided the laboratory was no place for a person who didn't like glassware but did like to write. So she took a secretarial course, then in 1947 applied for a job with three chemical publications—and got offers from all three. Jim Lee, now our Southwest Editor, persuaded her that she wouldn't go wrong if she picked CE.

I'm sure she didn't, either, and I know we didn't. For Frances' enthusiasm for her work and her cheerful outlook, even at deadline time, is a pleasure to see. And in the 2½ years I've been back on the job in New York, she hasn't missed a single working day. I guess Les Pope summed it up pretty well at the award party when he remarked, "she's a mighty good girl to have around."

When I asked Frances what she was going to do with her trophies, she came right back: "I'll give my mother the photographs, frame the certificate and hang it in my room, kill the cash in one glorious week-end of skiing in New Hampshire."

Most of you, I'm sure, will join us in congratulating Dick and Frances for the jobs they've done during the past year to make CE a better publication for you. End

CHROMALOX



combining Heater and Thermostat in one unit

ready to go on your Jobs!

CHROMALOX 'Packaged' Electric Heaters are ideal as permanent or portable heat sources in tanks, drums, process kettles and other containers. With CHROMALOX Heaters you can heat accurately and maintain the temperature of degreasing, cleaning, pickling and plating baths. You can melt greases, asphalt and similar viscous fluids. CHROMALOX Units may be had in the types, sizes and wattages required to efficiently do your heating jobs. They are available with sheaths of copper, stainless steel, alloy and lead for resisting the corrosive actions of the solutions you are using.

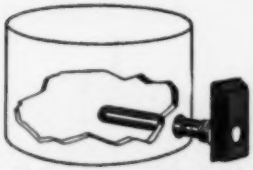
Nation-wide engineering service for on-the-job assistance and recommendations. Write, wire or phone for the name of the Chromalox Engineering Representative serving you.

CHROMALOX

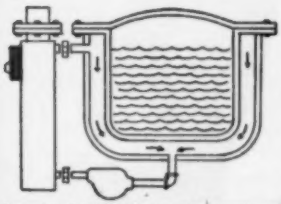
Electric Heat for Modern Industry

Variety and Versatility to fit your Needs Exactly

Chromalox Immersion Heaters with built-in thermostats for portable or permanent use. Drawing illustrates Immersion Units, equipped with sludge-legs, installed over the side of the tank for direct heating. Available in various metal sheaths to resist the corrosive action of the liquid compounds.



Compact, thermostatically controlled, screw-in type Chromalox Immersion Unit is easily installed in smaller tanks and other containers. Thermostat range is 100° to 180° F.



Chromalox Circulation Heaters give accurate, closely trolled heat up to 750° F. for heating Dowtherm, Aroclor or heat transfer oils. Other uses include water heating applications such as steam boilers and accumulators, kettles, tanks and processing equipment, preheating fuel oils, heating air, nitrogen and other gases; drying steam, plastic powders, etc.

Clip Coupon

For complete details showing how to use Chromalox Heaters in your applications.

Industrial Division IC-86
EDWIN L. WIEGAND COMPANY
7514 Thomas Boulevard, Pittsburgh 8, Pa.

Please send "100 Ways to Apply Electric Heat" booklet.

Name_____

Address_____

City_____ Zone____

State_____

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

Where industry has the "need" Oronite Chemicals supply the way

Most
ORONITE PRODUCTS
are available now—
some are in short supply
Please inquire!

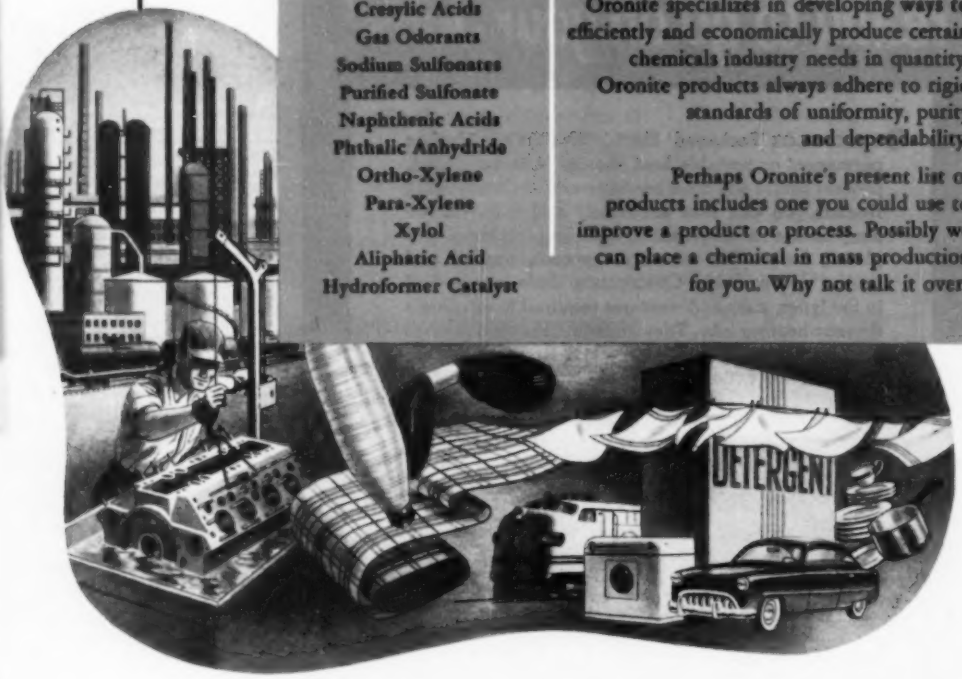
A partial list of products

- Detergent Alkane
- Detergent Slurry
- Detergent D-40
- Detergent D-60
- Wetting Agents
- Lubricating Oil Additives
- Cresylic Acids
- Gas Odorants
- Sodium Sulfonates
- Purified Sulfonate
- Naphthenic Acids
- Phthalic Anhydride
- Ortho-Xylene
- Para-Xylene
- Xylol
- Aliphatic Acid
- Hydroformer Catalyst

WHEN surface active chemicals were needed in quantity, Oronite found a way to supply them. Today, Oronite produces a variety of surface active agents. Some are oil-soluble, some water-soluble, some soluble in both oil and water; all are versatile products that find wide use by industry.

Oronite specializes in developing ways to efficiently and economically produce certain chemicals industry needs in quantity. Oronite products always adhere to rigid standards of uniformity, purity and dependability.

Perhaps Oronite's present list of products includes one you could use to improve a product or process. Possibly we can place a chemical in mass production for you. Why not talk it over?



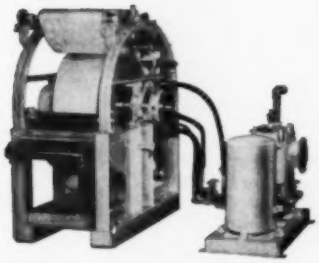
ORONITE CHEMICAL COMPANY

38 SANSOME ST., SAN FRANCISCO 4, CALIF. STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
MERCANTILE SECURITIES BLDG., DALLAS 1, TEXAS

2339

CLEANING UP A MESSY JOB

Continuously . . . WITH FEinc STRING FILTERS



FEinc Pilot Plant Filter . . . designed to prove out your process before scaling up. Ideal for making experimental runs. Available on rental-purchase plan, no capital investment required. Both scraper and string discharge. Compression and dewatering mechanisms included but may be disconnected, if desired.

No one wanted to work in the press room of a West coast pectin extracting plant. Dumping the hot, acid-soaked apple pulp from the filter bags was a dirty, messy job. Quality control suffered because so much depended on the skill and concentration of the operators.

Replacing the presses with a FEinc rotary vacuum filter completely eliminated these problems. Fewer men are required. Quality is uniform, and under semi-automatic control. Working conditions are no longer a problem.

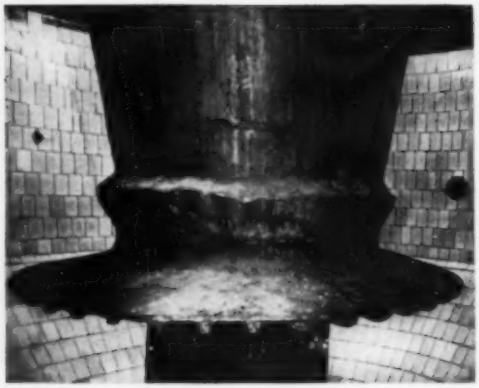
In one process after another, FEinc filters are bringing the advantages of continuous filtration to jobs that were previously handled by inefficient "stop-and-go" methods. FEinc's job-proven string discharge lifts the cake from the cloth—almost any type of cake from 1/16" thin to practically any thickness—with no smearing and blinding of the cloth, no blowback of filtrate, no scraping wear. Cloth life is up to 50% longer, and lighter, more efficient cloths can be used.

Send for free filtration bulletin 103 . . . today!

22

FILTRATION ENGINEERS INC.

155 ORATON STREET • NEWARK 4, NEW JERSEY



Applications of phenolic cements: joining of bricks in a pickling mill (left) and in a sulphuric acid saturator (right).

Phenolic Cements

For your files: the corrosion resistance of the phenolic cement most resistant to chemical attack—phenol formaldehyde resin with pure carbon filler.

RAYMOND B. SEYMOUR & ROBERT H. STEINER
The Atlas Mineral Products Co., Mertztown, Pa.

This is the second in a series of chart data presentations giving corrosion data for various materials of construction vs. a number of corrosives. Save these. Data for the corrosives of particular interest to you will be increased as the coverage grows to include all of the major materials of construction.—Editor.

Phenolic cements are customarily prepared on-the-job by mixing appropriate ratios of powder and liquid resin. Several different types of powders are available for use with phenolic liquid resins and the ratio of powder to liquid is controlled primarily by the mean particle size of the powder and the viscosity of the resin. Products based on barium sulphate, silica, asbestos and carbon are available commercially. However, since cements formed from carbon base powders are more economical, more resistant to chemical attack and usually stronger than those made with other fillers, all data presented are based on tests with pure carbon filled phenolic cements.

Phenolic resins based on condensates of phenol with furfural, furfuryl alcohol and formaldehyde are available commercially but since a product obtained from an alkaline condensation of phenol with a molecular excess of formaldehyde has superior chemical and physical properties, all corrosion resistance data in this report are based on a cement made from a product of this type. Unlike some liquid resins based on polymers of furfuryl alcohol, all commercially available phenolic resins have a relatively short shelf life and should be stored at temperature below 60 deg. F.

Carbon-filled phenolic cements are usually prepared by intimately mixing about two parts by weight of powder with one part by weight of a liquid resin. The working times for such mortars decrease as the temperature is increased and a working life of approximately 20 min. at 77 deg. F. may be considered as standard. These cements attain an initial set within a few hours but the setting process is usually not complete until several days have elapsed. Maximum resistance to solvents and salts is not attained until the cement is completely set. However, since this cement is acid-catalyzed, it is often satisfactory for acid service shortly after the initial set has taken place.

Like polyfurfuryl alcohol cements, carbon filled phenolic cements have high tensile strength (1,000 psi.) and high compressive strengths (10,000 psi.) but the adhesion to ceramic surfaces, while adequate, is somewhat less. Phenolic cements are somewhat more resistant than polyfurfuryl alcohol cements to weak oxidizing acids at temperatures up to 350 deg. F. but are not satisfactory for use in alkaline media. Case histories are available showing continuous immersion of phenolic cements in dilute boiling sulphuric acid for more than 10 years.

Similar precautions and limitations to those listed previously (Dec., 1951) for polyfurfuryl alcohol cements should be considered in the use of the accompanying charts. The same legend has been used.

It must also be recognized that the information given in the charts may be misleading in specific cases. For example, since a generic approach has been used, these data indicate phenolic to be unsatisfactory for use with sodium hypochlorite. Nevertheless, some phenolic cements have been used successfully in the paper and chemical industry in the presence of sodium hypochlorite. Other cases are on record where phenolic cements are giving satisfactory performance in the presence of nitric acid, concentrated sulphuric and even weak alkalis. However, since such performance is based in part on the fact that a minimum surface is presented to the solution, that the attack is not progressive and/or other phenomena not understood, the conservative use of the data represented graphically is preferred.

I'M GETTIN' OUTA HERE—FAST!

Banish Corrosion with "KARBATE" BRAND Impervious Graphite Towers

"KARBATE" TOWERS do more than retard corrosion — they eliminate it *entirely* from such processing operations as absorption, fractionation, evaporation, extraction, scrubbing, and many others. Furthermore, the widespread acceptance of impervious graphite for all types of corrosion-free process construction has resulted in the manufacture of monolithic tower sections and fittings in sizes to 24" I.D.

For example, the tower illustrated here incorporates the following standard components: *bottom section* with gas inlet, liquor outlet and support grill; *intermediate section* with hand hole and packed with carbon Raschig rings; *short intermediate section; top section* with "Karbate" feed assembly and wier plate distributor; and *cover* with gas outlet. All sections and fittings, including spring-loaded tie rods and heavy-steel pressure plates, are available for quick assembly to your specifications.

All openings are of adequate size. Generous gas-liquid disengaging space is provided in the top and bottom sections.

"Karbate" Impervious Graphite is in widespread use today. The increasing demand for corrosion-free processing equipment indicates that it will be the universally preferred construction material of tomorrow. For *only* impervious graphite can give you this unique combination of properties:

- **STRENGTH AND EASE OF INSTALLATION**
- **SIMPLICITY OF FABRICATION AND MODIFICATION IN THE FIELD**
- **HIGH HEAT CONDUCTIVITY**
- **RESISTANCE TO CORROSION AND THERMAL SHOCK**
- **NON-CONTAMINATION**

The term "Karbate" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

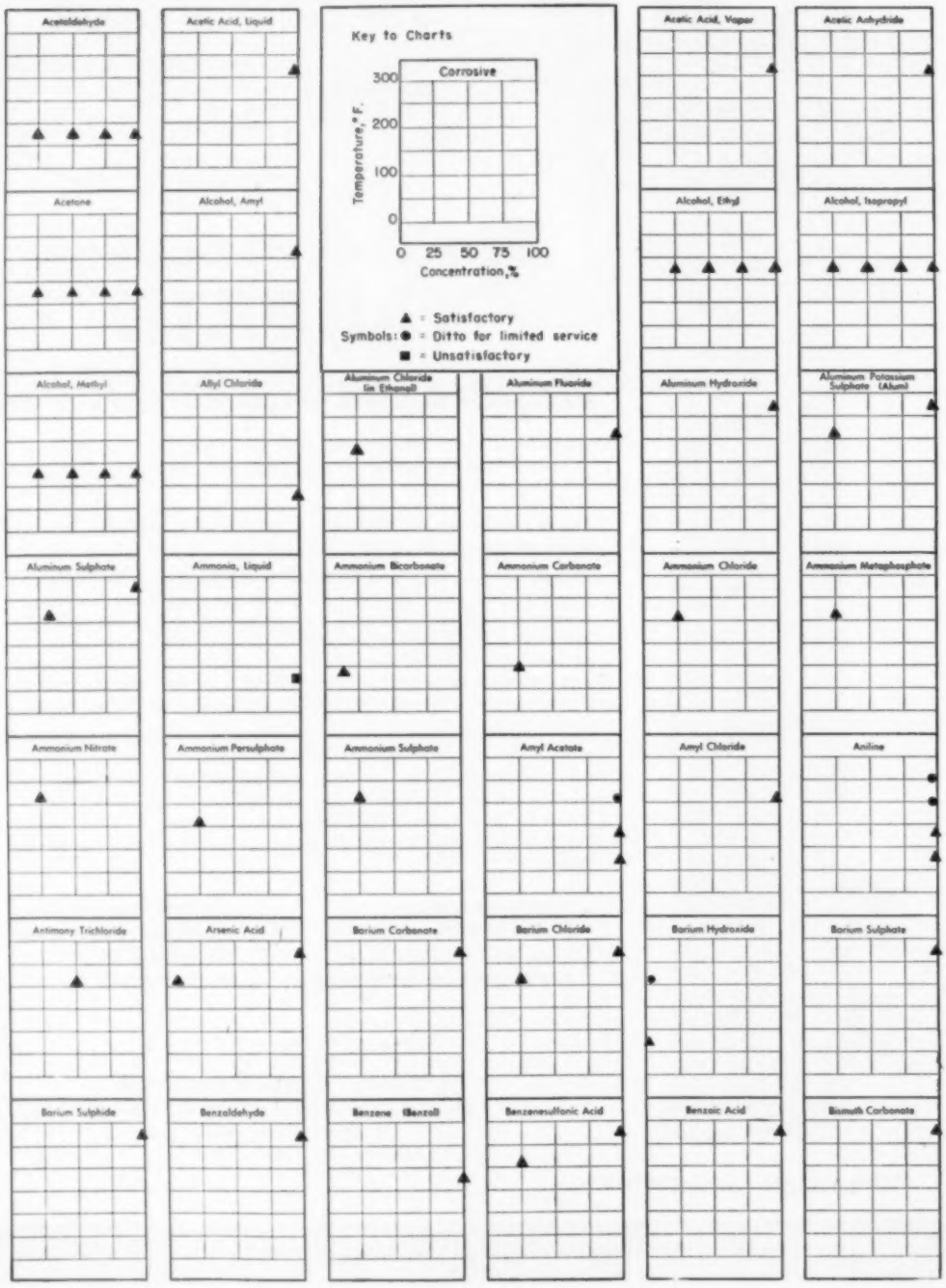
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

OTHER **NATIONAL CARBON** PRODUCTS

HEAT EXCHANGERS • PUMPS • VALVES • PIPING • TOWERS • TOWER PACKING • BUBBLE CAPS • BRICK • STRUCTURAL CARBON • SULPHURIC ACID CUTTERS • HYDROCHLORIC ACID ABSORBERS

Corrosion Resistance of Phenol Formaldehyde Resin Cements With Pure Carbon Filler



Standard DURCO CORROSION RESISTING ALLOYS & EQUIPMENT **equipment**

solves

specialized corrosion problems

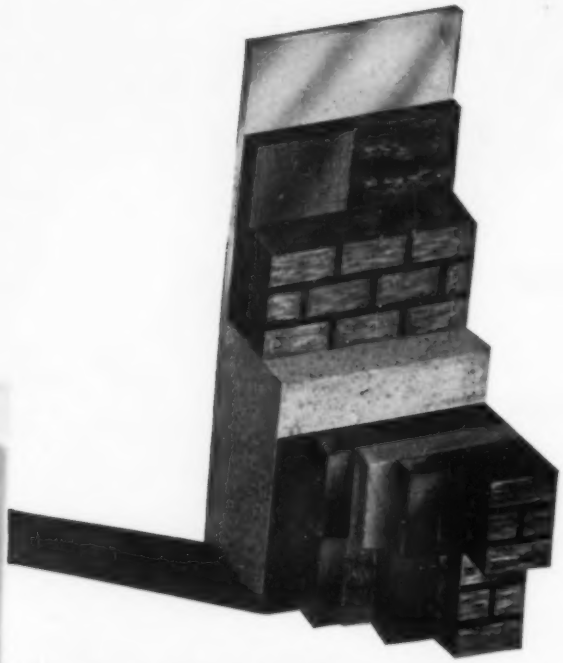
The standard line of Durco valves and Durcopumps for the chemical process industry is available in a wide variety of alloys. These standard valves and pumps often solve corrosion problems where special equipment would otherwise be necessary.

The Durco representative nearest you knows which Durco equipment will do the best job in your plant.

THE DURIRON COMPANY, INC.
Dayton, Ohio

The Series R Self-priming Durcopump

Illustration shows Durcopump frames ready for machining on one of the boring mills in the Duriron Company machine shop.



in CORROSION-PROOF LININGS . . . there is no substitute for ATLAS experience

Portrayed above are a number of ATLAS lining constructions for use on steel or concrete. Each has definite applications where it will give you the best service obtainable for your operating conditions.

ATLAS engineers have always recognized that there is no one lining material or construction best for all applications. Accordingly, for sixty years they have accumulated intensive laboratory and practical field data pertaining to most known corrosives. Over this period, they have developed materials which individually or in combined constructions offer the best long-term resistance.

Knowing the corrosives involved, processing temperatures and other conditions, the ATLAS Technical Service will recommend specific materials and constructions for your application. They will tell you as plain facts what ATLAS materials *will* and *will not* do.

INFORMATIVE DATA on ATLAS *products will gladly be sent to you.*

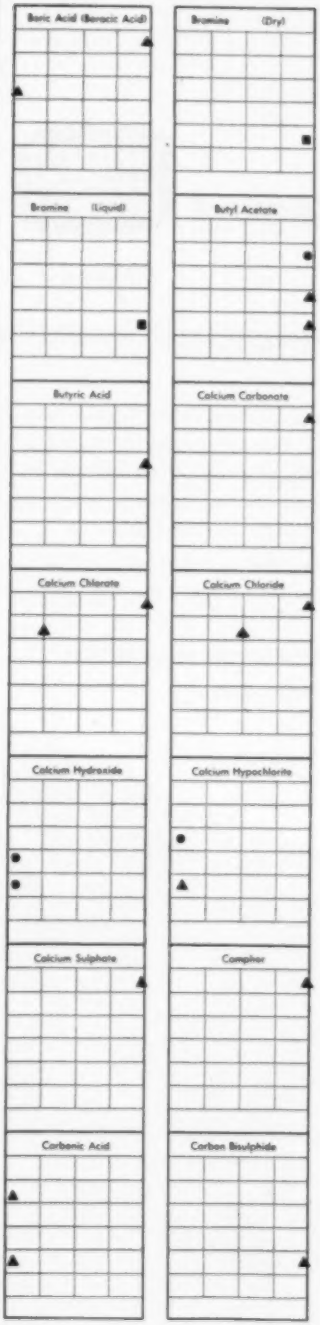
Corrosion-proof LININGS . . . *Bulletin 4-2*
Corrosion-proof CEMENTS . . . *Bulletin 5-2*
Corrosion-proof COATINGS . . . *Bulletin 7-2*

ATLAS PRODUCTS STAND . . . *between your process and corrosion*

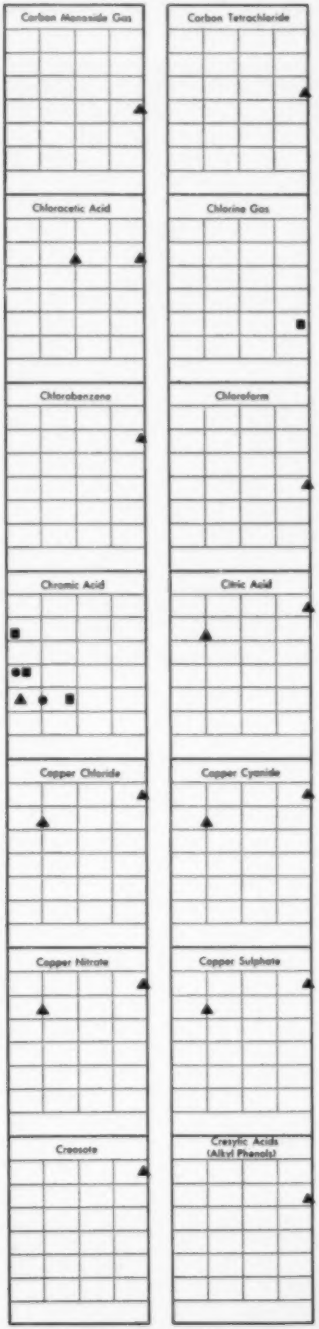
ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN PENNSYLVANIA
HOUSTON 1, TEXAS

Corrosion-proof: Cements—Coatings—Vessel Linings

Phenolic Cements (key on p. 266)



Phenolic Cements (key on p. 266)



(Continued on page 270)

PROBLEM:

A well-known process plant wanted to protect masonry, structural steel and equipment from corrosion caused by continuous moisture, chlorine, acetic acid, peroxides and other paint-destroying chemical agents.

SOLUTION:

Standardization upon Prufcoat Protective Coatings (in desired color scheme, including white on ceiling and wall areas) has put a stop to costly corrosion and radically reduced painting maintenance expenditures.

Where Acids or Alkalies Destroy Prufcoat PROTECTS

Continuous Moisture, Chlorine, Acetic Acid and Peroxides . . .

"Prufcoat has been the standard in our plant for all corrosion areas for some six years now," the superintendent of this plant recently reported . . . "Although we have continuously checked Prufcoat with other materials offered to us, we have not found anything to compare favorably with it."

Yes, in plant after plant, wherever conditions are really tough, Prufcoat is stopping profit-eating corrosion and cutting painting maintenance costs . . . *on concrete walls, ceilings, structural steel, pipes, tanks, ducts, machinery and equipment.*

Coat for Coat, Prufcoat Gives More Protection at Lower Cost Than Any Other Air-drying Paint

Get complete facts on performance-proved Prufcoat before scheduling your next paint job. Or better still, let a Prufcoat corrosion engineer make a preventive maintenance survey of *your* plant. *Write today, describing YOUR corrosion problems.*

Send for new Prufcoat Catalog describing all Prufcoat products

NEW! Prufcoat Heavy-Duty Primer P-50

Provides Positive Adhesion and Eliminates Underfilm Corrosion

Here at last is a fool-proof primer — *requires only normal surface preparation and dries overnight* — for the practical conditions encountered in process plants. Its highly inhibitive and positive adhesion characteristics provide the answer to controlling under-film corrosion and bonding top coats — *either plastic base or conventional paint* — securely to both ferrous and non-ferrous surfaces. Ask for Prufcoat Technical Bulletin 015.

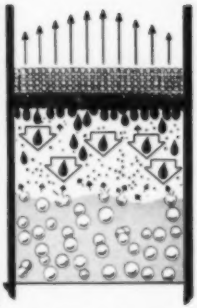
PRUFCOAT LABORATORIES, INC.
50 East 42nd Street, New York 17, N. Y.

Preventive Maintenance PAYS

ARE YOU BOTHERED BY ENTRAINMENT?

Look into METEX MIST ELIMINATORS

...and see how they will help boost production and cut costs



Removal of liquids entrained in gases is simple . . . economical . . . effective —when you use Metex Mist Eliminators! As the mixture passes through the Mist Eliminator, the entrained liquid is wiped out and retained by the extensive KNITTED wire area—until it coalesces into drops that are large enough to fall back through the rising flow. The gas passes on—freed from entrainment.

Efficiencies 95% or better • Little if any pressure drop • Can be installed in existing equipment • Made of practically any metal • No moving parts

Worth looking into, isn't it? Ask for your free copy of "Metex Mist Eliminators", an 8-page brochure that's packed with facts. Or write us about your specific entrainment problem.

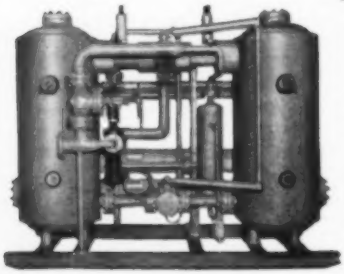
METAL TEXTILE CORPORATION

KNITTERS OF WIRE MESH FOR MORE THAN A QUARTER CENTURY

METEX

661 East First Avenue Roselle, N. J.

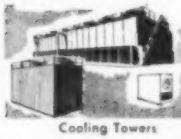
It's UNEXCELLED FOR DEPENDABLE DEHYDRATION!



The Quality Pritchard HYDRYER*

The Quality Pritchard HYDRYER* is *unexcelled* for dependable dehydration of air and other gases for instrument and process controls. Dual adsorbers provide continuous drying action. HYDRYER* is standard, packaged unit designed to reduce dew points to minus (−) 40°F. Only service connections are required. Specially designed HYDRYER* units can be tailored to meet your individual requirements.

*Registered Trade Name



Cooling Towers
Gas & Air Treating
Specialized Heat Exchangers

WRITE TODAY FOR BULLETIN NO. 16.0.080

Products of QUALITY Specialized Process EQUIPMENT

J.F. Pritchard & Co.

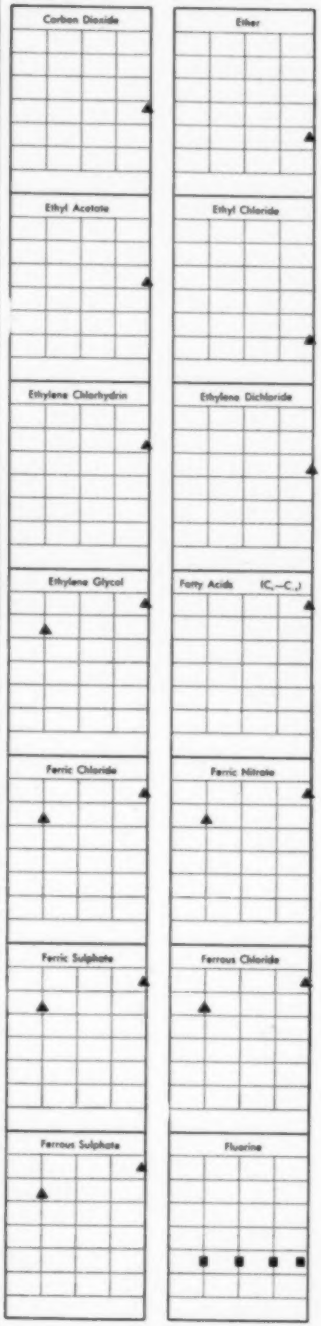
EQUIPMENT DIVISION

Dept. No. 177 908 Grand Ave., Kansas City 6, Mo.

District Offices: CHICAGO • HOUSTON • NEW YORK • PITTSBURGH
TULSA • ST. LOUIS • Representatives in Principal Cities from Coast to Coast

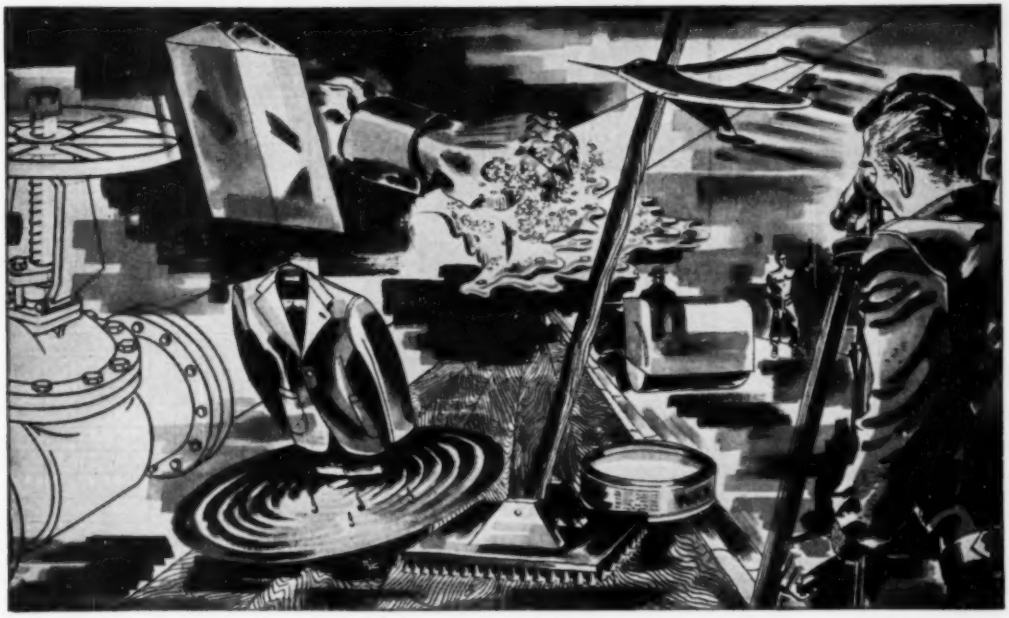
CORROSION FORUM, *cont. . .*

Phenolic Cements (key on p. 266)



(Continued on page 272)

Dissolve your process problems with ROOSEVELT solvents



Every product you see here has one thing in common . . . each uses a Roosevelt aliphatic naphtha at some time during its manufacture or use. In many cases a specific process problem had to be solved . . . sometimes by the selection of a standard Roosevelt solvent . . . sometimes through the use of a special solvent, specially produced to the manufacturers' specifications.

As you can see Roosevelt solvents have wide application. Does your product fit into the picture? It does if you need an aliphatic naphtha solvent. If the solvent you need isn't "standard" at Roosevelt, we'll make it for you. **Submit your specifications.**

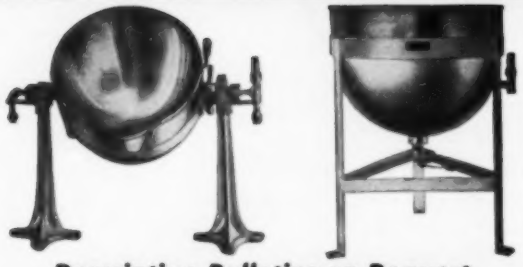
ROOSEVELT
oil and refining corp.

Write for your copy of Roosevelt's book of specifications. It's yours for the asking.

FOR EVERY PROCESSING NEED

LEE Kettles

WHERE CORROSION-RESISTANT EQUIPMENT IS NEEDED



Descriptive Bulletins on Request

LEE METAL PRODUCTS CO. INC.

417 PINE STREET . . . PHILIPSBURG, PA.

ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE

Schmieg CENTRI-MERGE

Still the Best Answer to Your

DUST and FUME PROBLEM

CENTRI-MERGE is COMPLETELY automatic in every phase of operation, COLLECTS dust and fumes as soon as they occur, CLEANS by high pressure water action, DISPOSES by mechanical conveyor. Dust and fumes are forced back on a stream of air to collection unit, washed and scrubbed from the air into tank below, permanently trapped under water for quick disposal as sludge.

Our engineers will be pleased to consult with you in the solution of your problem.

Here are Several Reasons Why—

1. **CENTRI-MERGE** greatly reduces heating cost by re-circulating cleaned air in many cases, occupies a minimum of valuable floor space, is easily installed.
2. **CENTRI-MERGE** gives non-fluctuating cleaning efficiency every minute of the day, collects and disposes of dust and fumes immediately.
3. **CENTRI-MERGE** operates at constant efficiency during many years of trouble-free service.
4. **CENTRI-MERGE** eliminates health or fire hazard in dust control by its automatic removal as sludge.
5. **CENTRI-MERGE** is always dependable, never requires a shutdown during working hours for cleaning or routine maintenance.
6. **CENTRI-MERGE** is engineered for minimum maintenance expense, is a compact, self-contained unit, constructed for flexibility of arrangement to suit plant requirements.

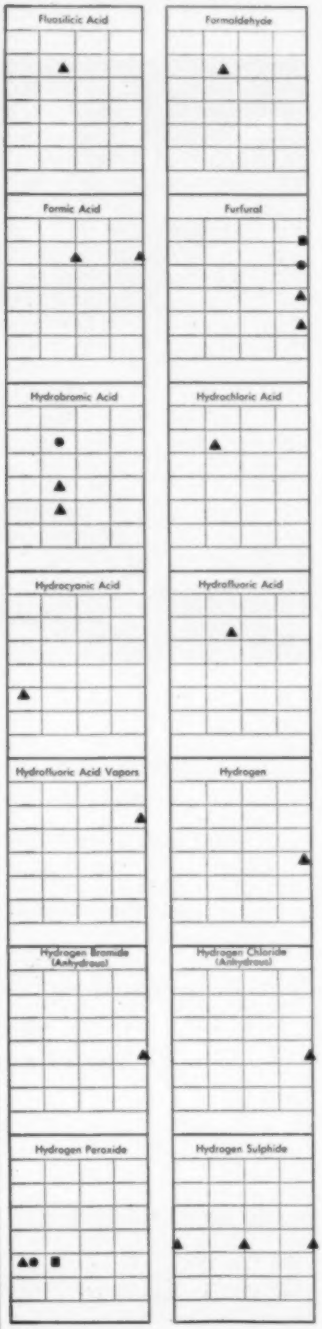
The Last Air Pump in CENTRI-MERGE

Schmieg INDUSTRIES INC.

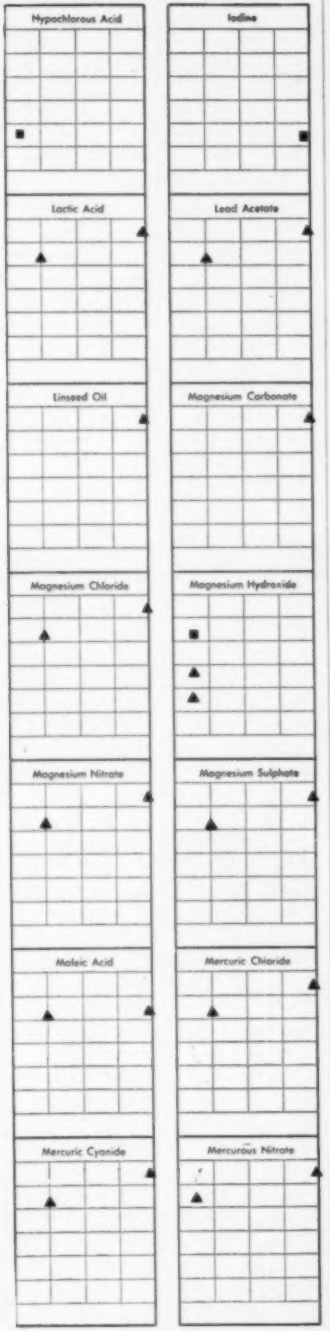
Engineers & Manufacturers

348 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

Phenolic Cements (key on p. 266)

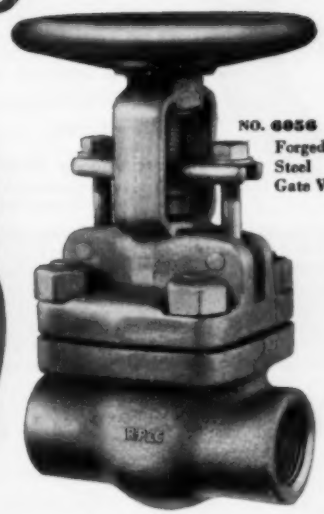


Phenolic Cements (key on p. 266)



(Continued on page 274)

R·P&C
VALVES



NO. 6056
Forged
Steel
Gate Valve

Here is a Premium Valve that is NOT premium priced

CHECK THESE DESIRABLE FEATURES:

- Bolted bonnet construction
- Heat-treated and hard chrome plated stainless steel wedge
- Stainless steel gland eye-bolts and nuts
- Two-piece gland and follower
- Tongue and groove bonnet joint

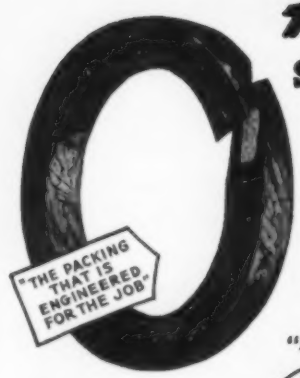
It's well designed. It's low priced in its field.
See your R-P & C distributor or write nearest R-P & C district office.

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

"Intentionally Better"
READING-PRATT & CADY VALVES

DURAMETALLIC

Packings



SAVE DOLLARS

The bearing-like sealing provided by Durametallic Flexible Metallic Packing means minimum wear on rods, shafts and sleeves! Genuine maintenance savings for you in repair, replacement and shutdown costs. . . . .

"Always Specify DURAMETALLIC"

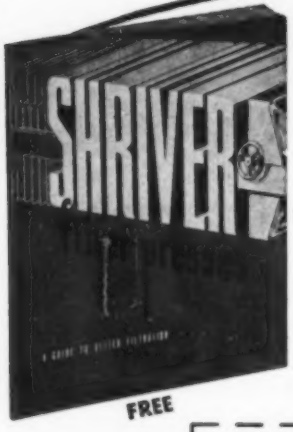
WRITE FOR DURAMETALLIC PACKING BULLETIN NO. 429CE

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO MICHIGAN

MANUFACTURERS OF METALLIC and SEMI-METALLIC PACKINGS
ROTARY MECHANICAL SEALS and PACKING TOOLS

THIS NEW SHRIVER BOOK



FREE

Gives STRAIGHT FACTS on Filtration

The new Shriver book serves as a valuable guide in selecting the right type of filtration equipment for improving your process and product. It tells—

1. How to Select Your Filter
2. How to Determine Type, Capacity, Construction
3. How to Determine Cost of Your Filter
4. Applications of Filters

MAIL TODAY

T. SHRIVER & COMPANY, Inc., 802 Hamilton St., Harrison, N. J.
Send me New Shriver Filtration Book.

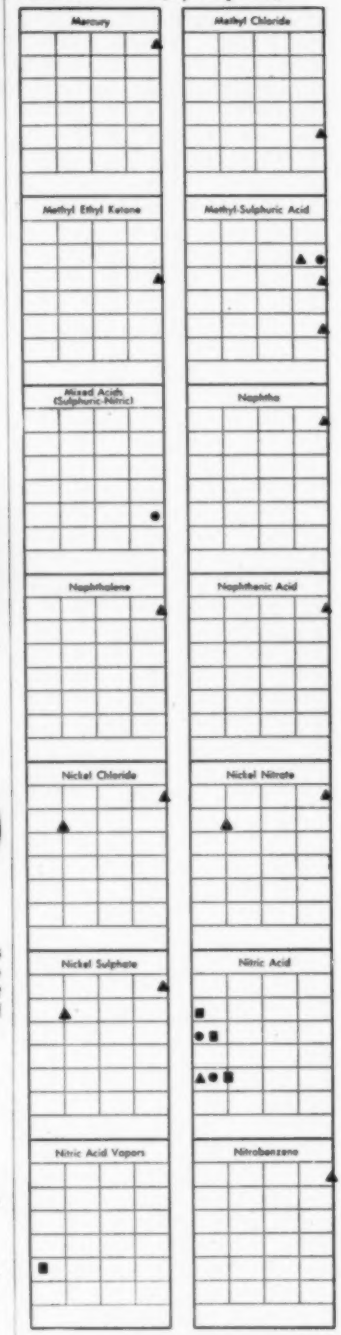
Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

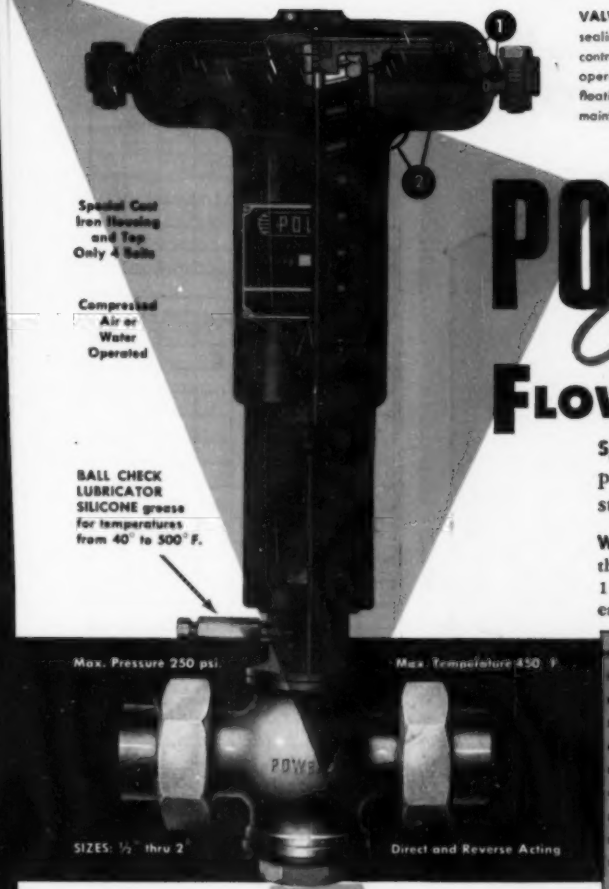
Phenolic Cements (key on p. 266)



(Continued on page 276)

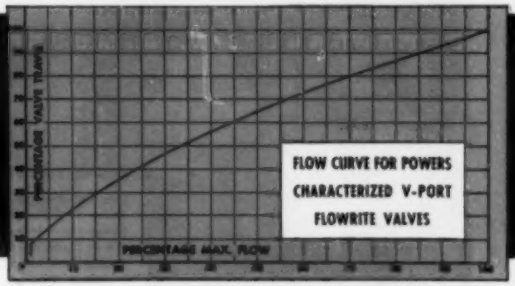
VALVE TOP—Durable moulded neoprene diaphragm (1) has positive sealing bead which provides increased sealing action with increasing control pressure. Efficient diaphragm form insures ample and constant operating power thru full travel. Piston Plate Assembly (2) has a free floating thrust plate which absorbs side thrust. Closely guided piston plate maintains stem in accurate alignment. Maximum air pressure in top, 22 psi.

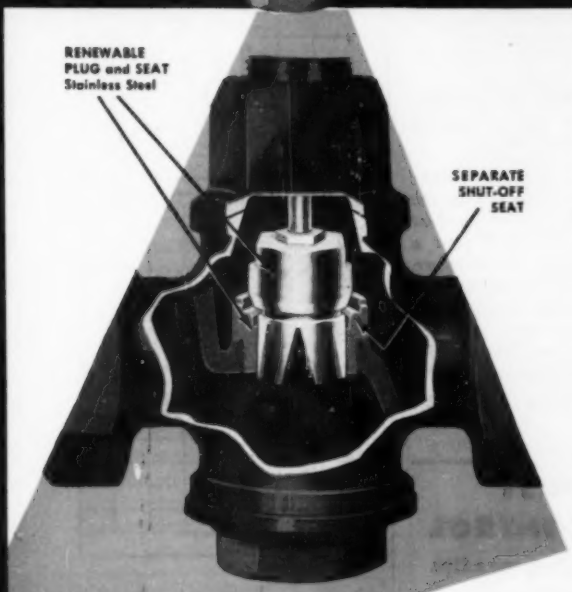
POWERS® SINGLE SEAT V-PORT *Characterized* FLOWRITE VALVES Give—


Special Cast Iron Housing and Top Only 4 Bolts
Compressed Air or Water Operated
BALL CHECK LUBRICATOR SILICONE grease for temperatures from 40° to 500° F.
Max. Pressure 250 psi.
Max. Temperature 450° F.
SIZES: ½" thru 2"
Direct and Reverse Acting

Special Flow Characteristics—High lift V-Port plug provides proportional flow throughout entire lift of stem as shown in chart below.

Wide Variety of Valve Sizes—Nine sizes are available, ½" thru 2". The ½" valve can be furnished with plugs to give 15%, 30%, 60% or 100% of maximum capacity. Plugs are easily interchangeable without removing valve from line.





Better Control—Less Maintenance—Superior design of stainless steel plug and seat reduces wire drawing, insures longer life and tight shut off. V-Ports do the throttling, protecting separate shut off seat. Plug and seat are truly removable and can be easily replaced in the field. Inner valves are machined and precision ground and lapped within very close tolerances.

Low Hysteresis—Due to smooth rolling diaphragm and polished stainless steel stem in preformed lubricated packing.

Easy to Adjust—Ball bearing adjusting screw; rust proofed steel calibrated springs with full travel in 5 or 10 psi.

Easy to Install—Powers Flowrite V-Port valves have double unions and bronze body with rugged construction to withstand piping strains.

Easy to Service—Valve and top are easy to take apart and re-assemble, facilitating inspection and maintenance.

Reasonably priced. Contact our nearest office for prices and assistance in selecting proper size valves

THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS • Offices in Over 50 Cities

Chicago 13, Ill., 3819 N. Ashland Ave. • New York 17, N. Y., 231 E. 46th Street
Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina Ave.
Mexico, D. F., Apartado 63 Bis. • Honolulu 3, H. I., P. O. 2755—680 Pilkoi at Kapi

OVER 60 YEARS OF TEMPERATURE AND HUMIDITY CONTROL

(a70)

In One Year

PANGBORN DUST CONTROL

SAVES $15,000

for MIDDLESEX SILVER CO.

(division of R. Wallace & Sons Co.)

Heart of profitable dust control at Middlesex Silver is a Pangborn CJ Collector like this. Shown above in a cutaway view are the filters which make the CJ ideal for heavy loading applications like this.

Pangborn Dust Control recovers valuable silver from plant dust!

Talk about profit! Every year Pangborn Dust Control at Middlesex Silver earns a profit of $15,000 after *all operating expenses* are paid! Centrifugal collectors are used to trap coarse dust particles . . . and *high efficiency is assured* because valuable silver fines are recovered by the big Pangborn CJ cloth screen Collector. Result to Middlesex: Pangborn Dust Control has more than paid for itself since installed!

Pangborn has a complete line of Dust Collectors, each designed for a specific job. No matter if the dust in your plant is *valuable, hazardous, or just a nuisance* . . . chances are Pangborn Dust Control will *save you money.* Find out . . . there's no obligation. For full information, write today for Bulletin 909A to PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

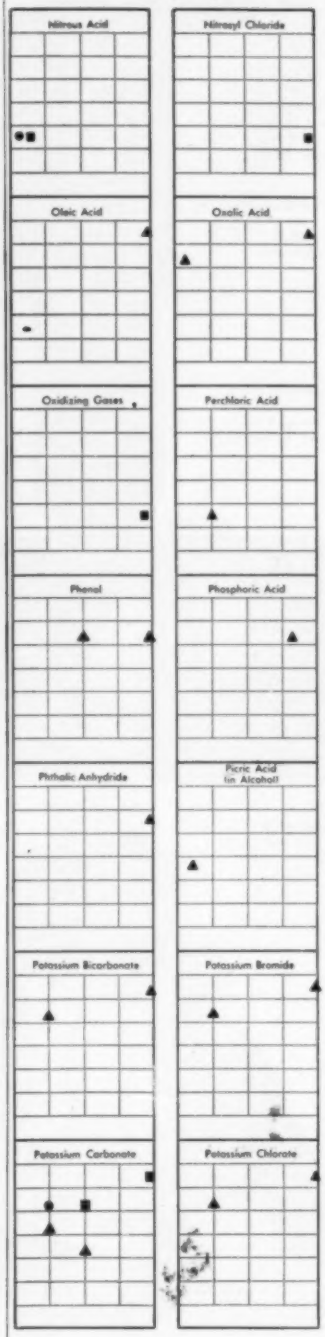
Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

Pangborn DUST CONTROL

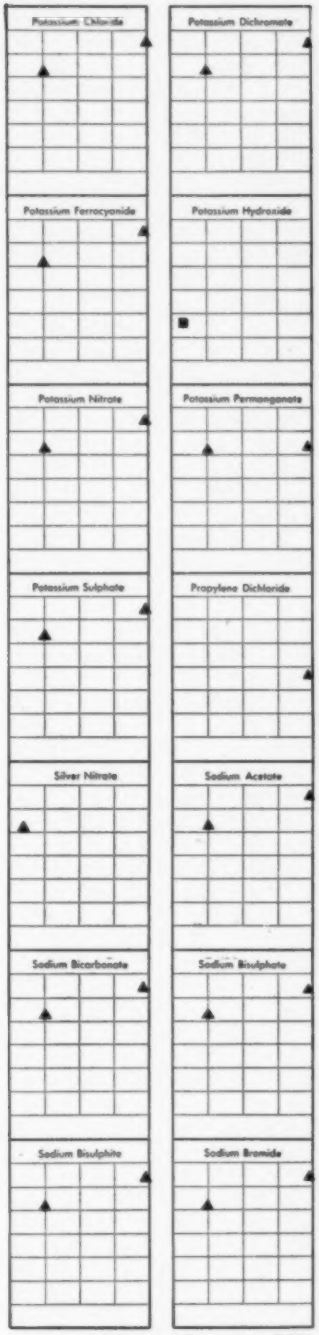
STOPS THE DUST HOG from stealing profits

CORROSION FORUM, cont. . .

Phenolic Cements (key on p. 266)



Phenolic Cements (key on p. 266)



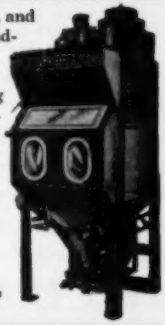
(Continued on page 278)

Here's BIG NEWS on Blast Cleaning Dust Control Precision Finishing

Blast Cleaning Unit is PORTABLE!

Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from..... $170.00 and up

Hydro-Finish SPEEDS POLISHING!



Removes scale, and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from $1295.00 and up

STOP DUST at the SOURCE!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from $286.00 and up

COMPACT Blast Cabinet for SMALL WORK!

Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Saves money all year 'round. Models from $315.00 up

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

Pangborn

MAIL COUPON FOR DETAILS

Check for more information
- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

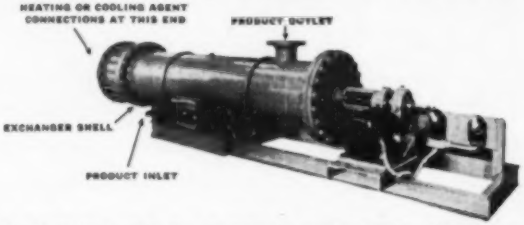
PANGBORN CORP., 2600 Pangborn Blvd., Hagerstown, Md.
Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....
Company.....
Address.....
City.....Zone....State.....

DO YOUR PROCESS HEAT EXCHANGERS FOUL UP?

. . . THEN USE THE Paracoil

AUTOMATIC SELF CLEANING HEAT EXCHANGER



Specifically designed for those heat transfer processes involving the continuous heating or cooling of viscous materials or fluids that normally deposit heat insulating films on exchanger tubes or autoclave surfaces.

With the Paracoil Self Cleaning Heat Exchanger all product deposits are automatically removed from exchanger tubes by motor driven Scraper Surfaces moving continuously or at intervals determined by needs of the specific process.

OBTAIN . . .

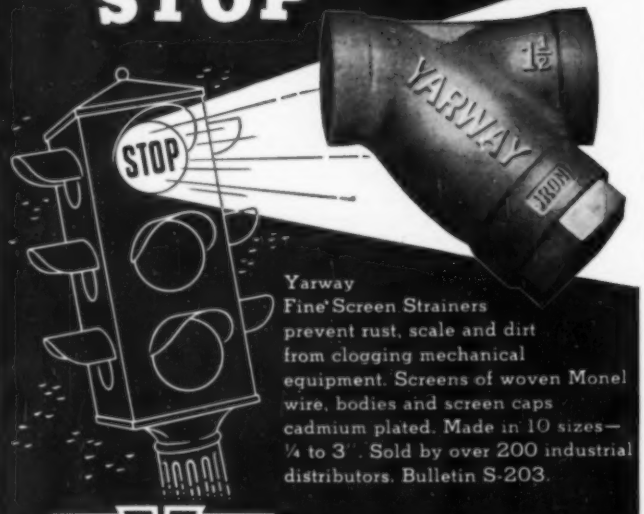
- **Maximum Production** — No plant shutdown for cleaning!
- **Maximum Heat Transfer** — Tube Surfaces are always clean!
- **A Better, More Uniform Product** — Conditions at their best!

Particularly adapted to the handling of vegetable oils, fats, waxes, pastes, creams. Write for Bulletin HE-100. We invite your inquiries.

DAVIS ENGINEERING CORPORATION

1064 EAST GRAND STREET. ELIZABETH. N. J.

SAYS **STOP** TO SOLIDS



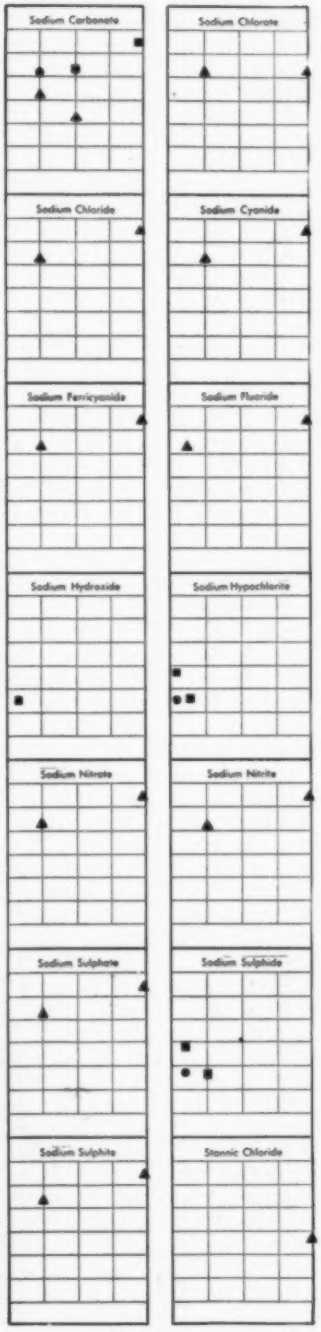
Yarway Fine Screen Strainers prevent rust, scale and dirt from clogging mechanical equipment. Screens of woven Monel wire, bodies and screen caps cadmium plated. Made in 10 sizes—¼ to 3". Sold by over 200 industrial distributors. Bulletin S-203.

YARWAY STRAINERS

YARNALL-WARING CO., 137 Mermaid Ave., Philadelphia 18, Pa.

CORROSION FORUM, cont. . .

Phenolic Cements (key on p. 266)



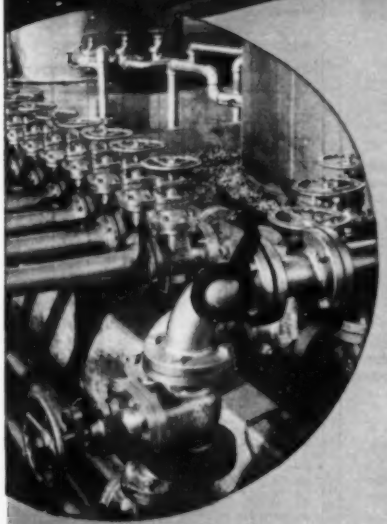
(Continued on page 280)

. . . at it's new $5,000,000 oil research center

UNION OIL COMPANY

planned for lasting economy . . . installed JENKINS VALVES

Architects
AUSTIN, FIELD & FRY, LOS ANGELES
General Contractors
P. J. WALKER CO., LOS ANGELES
Mechanical Contractors
S. GLEN HICKMAN CO., LOS ANGELES
Consulting Mechanical Engineer
SAMUEL L. KAYE, LOS ANGELES



SOME OF THE 3000 JENKINS VALVES installed at the new research center. Many structural innovations, designed to simplify maintenance, are unique in this plant. Tunnels between buildings carry all pipelines; make them readily accessible. Air-conditioning system supplies 100% fresh air to laboratories at all times. The administration building, shown above, is one of 14 major buildings on a 100 acre site.

The new 14-building research center of the Union Oil Company of California is unique in many features of design. Here, a research staff of 250 will have every modern facility for developing products that will shape the company's future progress.

The same future-minded attitude was maintained toward plant operating costs by the architects and engineers who specified equipment. To insure lasting efficiency and maintenance economy, they chose Jenkins Valves for more than 3,000 control points on the miles of steam, water, sanitation, fire-control, and other pipelines essential to operations.

Like so many of the nation's top-flight building specialists, these men have confidence in the *extra measure* of efficiency and endurance built into Jenkins Valves.

Despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Avenue, New York 17; Jenkins Bros., Ltd., Montreal.

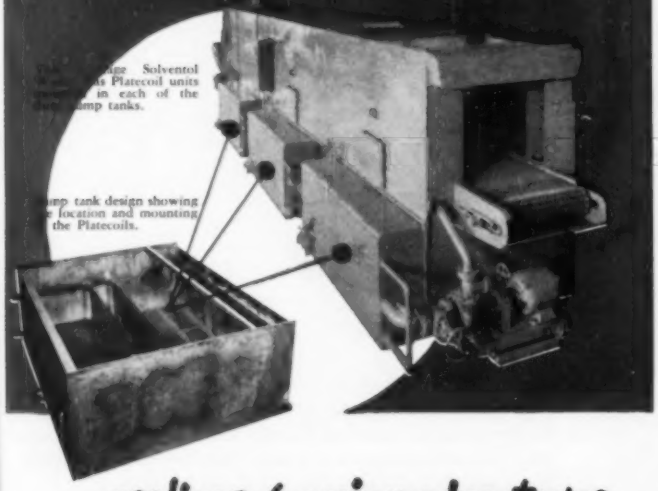
JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

now! SOLVENTOL CHEMICAL IS SAVING MONEY with PLATECOILS



...ing Solventol
...s Platecoil units
... in each of the
...mp tanks.

...mp tank design showing
...e location and mounting
... the Platecoils.

... realizes 6 major advantages

Solventol Chemical Products, Inc., Detroit, Michigan has joined the growing list of manufactures who are saving money by using Platecoils in their products. Use of Platecoils as the heating medium in their 3-stage washer has resulted in 6 major advantages:

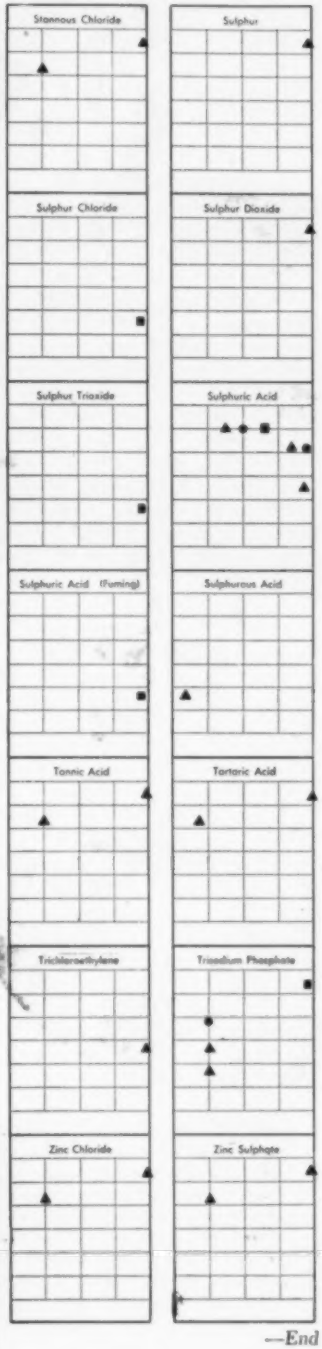
1. *Simplified installation.*
2. *Sharply reduced installation costs.*
3. *A higher rate of heat transfer.*
4. *Low first cost.*
5. *Solution flow controlled without baffles.*
6. *Increased sales advantages due to easier maintenance.*

The Platecoils are installed in each of the three sump tanks as shown in the inset picture. The pre-fabricated Platecoil units are installed in but a fraction of the time required for bending and installing pipe coils. That's why most manufacturers find it costs less to buy and install Platecoils than to fabricate pipe coils in their own plant.

In addition, the Platecoils are about 50% more efficient than pipe coils. As a smaller size Platecoil can be used, considerable savings in steel and more compact machine designs are possible.

If you're looking for ways to conserve steel and save money, get the facts on Platecoil today. Write for bulletin P61.

Phenolic Cements (key on p. 266)



—End

Lead in Modern Chemical Construction

What you should know about the various types of lead construction, if you use lead in your processing or have plans for doing so.

KEMPTON H. ROLL

The latest techniques and improvements which have passed the test of actual industrial application in the chemical process industries include improvements in methods of supporting sheet lead, new methods of testing lead linings and welds, lead bonded to steel (usually referred to as bonded or homogeneous lead), lead covered copper or steel heating coils, and the use of acidproof brick with an impervious lead interliner.

SHEET LEAD CONSTRUCTION

Lead in the form of sheet supported in a steel or wooden framework, or a steel or wooden shell lined with sheet lead are the two principal methods of sheet lead construction. The latest developments in both methods, generally termed cage construction and lead lined construction, are described in detail below. Actually there are probably as many modifications as there are applications for both types of construction, for they are the oldest methods of using lead as a material of construction. But despite their antiquity, they still represent the major part of all the lead used by industry for handling corrosives.

Sheet lead construction is ideal for the storage of corrosive chemicals and is generally regarded as the method which requires the least capital outlay. Should repairs be necessary they are easily effected in the field and once the vessel's useful service life has expired, the lead may be reclaimed as scrap and sold at the highest relative rate of any of the common metals. Sheet lead can easily be assembled and welded in the field with the aid of only a lead burning torch. Tanks of great variety both as to design and usage—pickling, chromium and copper plating, anodizing, acid storage, manufacture of a wide variety of chemicals—are among the common applications of sheet lead linings.

CAGE CONSTRUCTION

The first chambers for the manufacture of sulphuric acid were of cage construction, simply large sheet lead boxes supported by timbers. Acid chambers today are being built with lead walls supported in a special steel framework that permits the metal to move freely with changing temperature. A detail of the Mills-Packard system for suspending the lead while at the same time permitting freedom of movement is illustrated (p. 282).

The cage or basket type of support is by no means new but its merits are still not appreciated by many potential users. In place of using a steel or wooden shell lined with sheet lead, a basket or cage-like structure made of steel flats and angles welded together to form an open framework is used for supporting the lead. Depending upon the height of the vessel, the straps are often placed closer together at the bottom than at the top to give extra support where hydrostatic pressure is greatest.

This type of open construction in which the lead is fully exposed to the atmosphere provides an extremely effective and inexpensive method for cooling liquids which are received hot or where heat is generated by reaction such as in acid dilution. Heat is dissipated rapidly to the atmosphere by air convection and radiation.

Cage construction offers several other advantages over solid steel tanks as long as high pressure or vacuum is not encountered. The spacing between the straps permits a leak to be seen immediately. Furthermore, it can be repaired from the outside in a matter of minutes. If the size of the vessel calls for extra support, internal strapping which of necessity must pierce the lead lining in order to be fastened can be eliminated by using the cage-type construction. Instead strips of lead can be burned from the outside over the horizontal steel straps and thus support the lead.

Other advantages of cage construction are lower material costs and often easier assembly in the field, the handling of bulky and heavy steel sheets being eliminated.

LEAD LINED CONSTRUCTION

Sheet lead lined wooden or mild steel tanks are in common usage and have been for many years. Storage vessels for corrosives, nickel, chromium and copper plating tanks, anodizing tanks, tanks for electrolytic refining of lead, zinc and copper, chemical reaction vessels, pickling tanks are all common examples of equipment lined with sheet lead. Lining thicknesses usually range between 8 and 16-lb., sometimes two or more different thicknesses being used in the same vessel such as in areas subject to erosion or where greater strength is required. Either existing vessels or specially constructed ones of concrete, wood or steel can be readily lined with lead to make them suitable for handling corrosives. In other words, by lining any old but structurally sound vessel with lead, it becomes unnecessary to construct an entirely new one, thus obviating the extra costs of labor and materials.

In small storage vessels the lining is hung from the top without any strapping. More often it is provided with additional support by any of the means described below. Generally in the form of strapping, extra support is resorted to when fluctuating temperatures, fatigue or stress corrosion must be considered. In deep tanks, because of the high density of lead (0.410 lb. per cu. in.), loose linings must be strapped to overcome the effect of gravity. In practice, the optimum height of a loose lead lined vessel without benefit of any support from strapping rarely exceeds 10 ft., depending upon the weight of lead. Good vertical strapping practice is to place the straps about 18 in. apart and no more than 24 in.

Fastening the straps used to support loose sheet lead linings has been simplified by a recent innovation making use of automatic stud welding. A threaded stud can now be butt-welded directly to the inside of the shell with a special gun into which the stud is loaded. A press of the gun's trigger applies welding current for a preset amount of time. The stud has a small recess at its end which contains the flux necessary for welding. A ceramic ferrule over the end of the stud confines the arc to a limited space, giving a shielded-arc effect. Portable motor-generator sets or battery-powered units provide current for the arc.

The stud may be welded directly through precut holes in the lead or between two lead sheets where they butt together. Half-oval steel strapping is slipped over the threaded stud and on top of the lead. The top of the strap is recessed to receive the fastening nut (see cut). After bolting the strap, a lead strip is placed

Kempton H. Roll is with Lead Industries Association, 420 Lexington Ave., New York, N. Y.

over the steel and welded securely on each side to protect the steel from corrosion. Studs are usually placed on 18-in. centers, occasionally 12 in., but never more than 24 in.

Often it is advantageous to use a large steel cut washer and a roundhead bolt to fasten sheet lead to a steel or wooden shell. The bolt and washer are covered with a lead cap which is burned to the lining. This tends to distribute the load over a large area and thus aids in minimizing fatigue. The bolts used in this manner are evenly spaced over the entire lining at about 18-in. centers.

Sheet lead for lining all types, shapes and sizes of chemical equipment usually comes in rolls ranging from 8 to 12 ft. wide and up to 60 ft. long, depending upon the thickness of the sheet. A standard roll is generally 20 ft. Thickness varies from 1/80 in. to 2 in., or measured in the parlance peculiar to the lead industry —½ lb. to 120-lb. (lead 1/64 in. thick weighs about 1 lb. per sq. ft. and is designated 1-lb.). In chemical construction lead weighing less than 8-lb. is rarely encountered.

TESTING OF LEAD LININGS AND WELDS

A non-destructive method of testing lead linings and welds requiring no electrical equipment and involving only the expense of the chemicals used was recently placed on the market. The new process is used for inspecting the surface of metals and detecting any openings such as cracks, laps, cold-shuts and porosity. Discontinuities are indicated by bright red lines, dots or blotches on a white background.

The process involves the use of three liquids, penetrant, developer and cleaner, which may be sprayed, brushed or dipped on the surface to be inspected. First the surface is cleaned, then covered with the penetrant which is left on for 5 or 6 min. A gallon of penetrant will cover an area of approximately 3,000 sq. ft. After removing the penetrant with the cleaner, the developer is applied. The red penetrant will remain in any crevices until it is drawn to the surface by the action of the white developer. A red line or blotch indicates a crack or cold-shut; a series of red dots in a line indicates a tight crack, cold-shut or partially welded lap. Tiny hairline cracks which appear when lead has been overstressed, particularly under corrosive conditions, may be detected by the above-mentioned method.

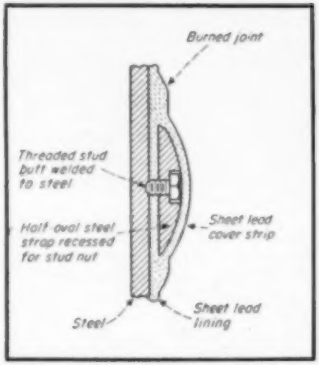
Bonded lead linings described below may be tested by either the above method or by this one: brush on a solution of 50 percent hydrochloric acid and allow to stand for 24 hr. The presence of pinholes will be indicated by rusty discoloration. After marking such spots the entire surface is washed with water and repairs made where required.

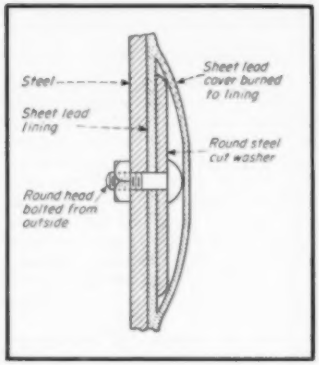
Another leak detection method that has also been used on lead is based upon a fluorescent penetrant instead of a colored dye penetrant. Surface discontinuities are indicated by this method in much the same manner as by the dye penetrant method described above. A fluorescent penetrant is applied by brushing or spraying and then removed by a water wash, after 5 to 15 min. Developing powder brings out the penetrant and observation under a "black light" reveals any discontinuities.

Lead-Lined Construction

Mills-Packard system

Cage-type construction


Burned joint
Threaded stud butt welded to steel
Half oval steel strap recessed for stud nut
Sheet lead cover strip
Steel
Sheet lead lining



Methods of supporting loose sheet lead linings

BRICK AND LEAD LININGS

The handling of corrosive slurries and other combinations which both corrode and erode most materials of construction have led to the development and practical acceptance of brick and lead lining, i.e., a steel shell lined with lead, with or without a layer of asbestos sheeting followed by a layer or two of acidproof brick set in suitable acidproof cement.

Brick and lead lined vessels are recommended particularly where any of the following conditions prevail: (1) abrasion or erosion is a factor, (2) severe corrosive conditions are encountered (for example, where acids and alkalis must be handled in the same vessel), and (3) thermal shock—rapid and high temperature fluctuation.

Brick linings alone are always somewhat permeable due to the inherent porosity of the brick and the inability of the bricklayer to secure a continuous film of cement between and in back of the brick. No cemented conglomerate can be as impervious to liquids as can a metal. In fact, the best grades of acid-proof brick are intentionally made 3 to 4 percent porous in order to provide optimum

Announcing NEVSOLV

. . a group of aromatic Petroleum Solvents

NEVSOLV aromatic Petroleum Solvents are available in a number of different distillation ranges from low boiling to high boiling. In addition to the standard distillation ranges, we invite inquiry on special fractions to meet your particular requirements. NEVSOLV Solvents are manufactured to rigid specifications, insuring high solvent power, constant evaporation rates and negligible residue.

Write for samples and further information on these uniform Neville solvents.

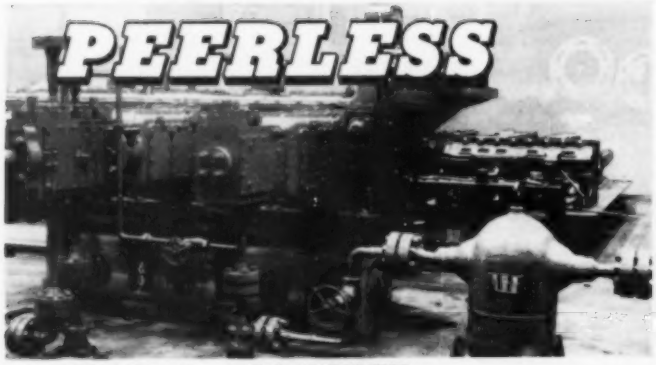
THE NEVILLE COMPANY

PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

Part of Neville's current expansion program is this new plant recently completed at Neville Island, for the production of NEVSOLV Solvents

A-43



HAS the ANSWER . . .

Pictured above is a Peerless 5000# W.P. Separator. It is removing condensate and lubricating oil from the reaction gas to prevent contamination of the catalyst, for production of ammonia.

Consult Peerless for help in solving your entrainment problems.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P O BOX 7193 • DALLAS, TEXAS • Dixon 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Lessmann POWER SHOVEL

32 Years of "Know How" means Lessmann!

When You Have a Loading or Moving Job You Want A Machine Built To Handle It!

Loading into hopper at 9'. Loading shovel on very soft ground could only be accomplished with load retraction or load balanced.

Now, after 32 years of shovel manufacturing LESSMANN has developed the one and only real power shovel, not reliant on traction. Why ram and bang a tractor unit to pieces when it isn't necessary? The LESSMANN HF10, perfected in 1949, has proven itself under the most rugged conditions.

1. The only real Power Shovel
2. Will dig 12" below wheel level
3. Digs in on level ground
4. Forty-two inch forward sweep
5. Carries its load close to tractor
6. Loads shovel at any height
7. Unloads shovel at 42" from tractor at 9'-4". (Higher dumping clearances available)
8. Double shovel control cylinders
9. Shovel locks in loading position
10. Full tilting backfiller blade
11. No ramming to load shovel
12. Loads shovel without traction
13. Sixty per cent greater loading power
14. Ford V8 Industrial Motor gives 50% surplus of power under traction conditions

Compare the Lessmann. It has power-to-go and power-to-do. It's complete. It's built to last. It is the machine for you. SOME DISTRIBUTOR TERRITORY OPEN

MFD. BY Lessmann MFG. CO. DES MOINES IOWA

thermal shock resistance. A lead lining acts as an impervious barrier between the shell and the brick so that any corrosive seepage through the brick lining is retained by the lead, thus preventing damage to the steel shell. The lead and brick linings are then complementary to each other and serve as a particularly effective type of construction.

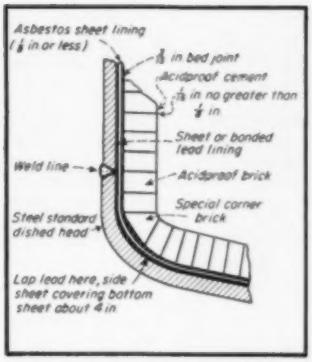
APPLICATION

In building a brick and lead lined steel tank, the tank should be built to support the weight of the entire structure. Neither the lead nor the brick can be assumed to contribute any structural strength to the vessel. Bottoms should be dished where pressure is involved and the welds performed at or above the bottom edge (see drawing).

A lead lining is applied next after removing all burrs or other projections on the inside of the tank which might cause injury to the lead. Chemical grade 8 or 10-lb. lead ($\frac{1}{8}$ or $\frac{3}{16}$ in. thick) is usually adequate and has found most application. It should be lapped over the top edge of the vessel to prevent seepage between the lining and the steel, the side sheet extending down about 4 in. over the top of the bottom sheet. They should be welded together around the entire exposed edge. In very large vessels or at high operating temperatures, it is advisable to strap the lead to the shell. Under severe operating conditions bonded lead linings are employed, in which case lead of greater thickness is generally used. Because the initial cost is essentially that of the bonding operation, using thicker lead adds little proportionately to the total expense involved—but it does make for increased service life.

After installation, the lead lining should be tested for leaks in the manner described in the section above on testing of lead linings and welds. After the lead has been installed and tested, a layer of asbestos sheeting or some similar material $\frac{1}{16}$ to $\frac{1}{8}$ in. thick is added to act as a cushion between the brick and the lead protecting the lead against abrasion during expansion and contraction.

Finally, the vessel is lined with one or two courses of brick, the brick selection depending upon several factors: the degree of acid insolubility required, minimum allowable porosity and the degree of thermal shock involved. The thickness of the brick is determined by the dimensions of the vessel, the amount of mechanical abuse anticipated and the thermal insulation required. Brick size is commonly 9 in. × 4½ in. × 2½ in.,


Asbestos sheet lining (⅛ in. or less)
⅛ in. bed joint
Acidproof cement
⅛ in. no greater than ¼ in.
Sheet or bonded lead lining
Weld line
Acidproof brick
Special corner brick
Steel standard dished head
Lap lead here, side sheet covering bottom sheet about 4 in.

Bottoms of brick and lead lined tanks are dished where pressure is involved.

though other sizes and special shapes are available.

Brick in two courses is laid so that the wall and the floor courses can be keyed in and joined with a minimum of cement, usually a $\frac{1}{16}$ in. layer and no greater than $\frac{1}{8}$ in. The bed joint (between the brick and asbestos or lead) is about $\frac{1}{8}$ in. thick. Classes of cements are considered on the basis of desired corrosion resistance, temperature, erosion and porosity, plus the economics of cement and installation costs. Acidproof cements available on the market include silicate cements, sulphur cements, phenolics, furfural alcohol resin base cements and modified phenolic resin base cements. Litharge-glycerin cement (80 to 100 cc. of glycerin per lb. of litharge) is occasionally used, particularly in the paper making industry where its excellent resistance to sulphurous acid liquors is utilized. It has good water resistance, withstands attack by nonoxidizing acids, and may be used safely up to 350 deg. F.

BONDED LEAD LININGS

A bonded lead lining in effect combines the corrosion resistance of lead with the strength of steel. Bonded lead is simply a layer of lead bonded to a steel plate so as to form a homogeneous or integral metallic structure. The thickness of the layer, depending upon the ultimate use, ranges from $\frac{1}{8}$ in. to $\frac{3}{4}$ in., with $\frac{1}{4}$ in. to $\frac{3}{8}$ in. being most common. By literally anchoring the lead to steel at all points of contact, relative movement between the two metals is minimized.

Bonded lead lined vessels are recommended for use where any of the following conditions prevail: (1) fluctuating temperatures are encountered, (2) high temperatures, (3) the vessel operates under vacuum, (4) vibration or physical shock are encountered, and (5) heat transfer is important such as

Wanta pump something at lower cost?

CHECK HERE

Air	Dye Solutions	Latex	Salt Water
Alcohol	Edible Oils	Mash	Shortening
Ammonia	Ethane	Methane	Sludge
Beer	Fish Oils	Milk	Soap
Benzol	Formaldehyde	Molasses	Sodium Chloride Solution
Boiler Feed Water	Fresh Water	Naptha	Sodium Silicate
Brewer's Mash	Gas, Manufactured	Nitric Acid	Sodium Sulfate Solution
Butter	Gas, Natural	Nitrogen	Starch
Butane	Gasoline	Oil, Crude	Sulphuric Acid
Cane Syrup	Glucose	Oil, Refined	Sump Water
Calcium Carbonate Slurry	Glue	Oxygen	Sweet Water
Calcium Sulfate Slurry	Glycerine	Paint	Tomato Juice
Casein Solutions	Glycols	Potassium Hydroxide	Varnish
Cement Slurry	Hydrochloric Acid	Propane	Vinegar
Chocolate	Hydrofluoric Acid	Raw Boiler Feed Water	Viscose
CO_2 Gas	Ink	River Water—Dredging Operations	Water (various)
Crude Oil	Jam	Rosin	Wax
Dairy Products	Jelly		Whey
	Ketchup		
	Lacquer		

THIS list of fluids will give you a rough idea of the diversity of pumping jobs in which Darcova Pumcups are responsible for really *big* savings.

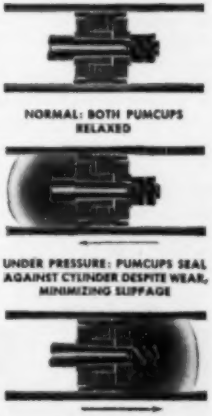
It boils down to the fact that Pumcups all but eliminate fluid slippage *throughout* their life span . . . and they *last many times as long as other packings.* Think of the down-time avoided, the production gains due to prolonged high efficiency, and the time-and-money-saving reduction in maintenance!

Years of application research have gone into the development of Pumcups. Made today in standard as well as many special compositions and textures for a wide range of temperature and pressure conditions, they offer you superior cost-cutting service in virtually *any* pumping job, simple or tough! And they're available in diameters from 1 to 20 inches.

SEND FOR FREE BULLETIN

Why not weigh *all* the facts? Bulletin 4401 covers Darcova Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air or hydraulic mechanisms. Write for yours today.

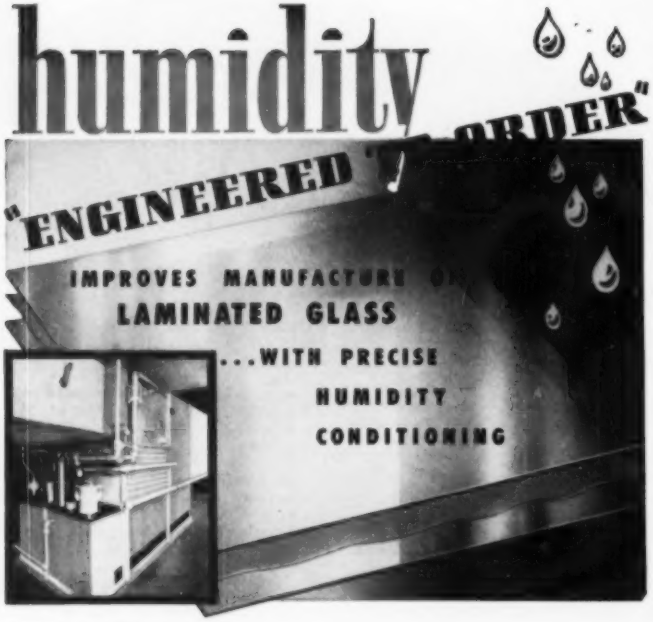
DIAGRAM OF DARCOVA PUMCUP ACTION (greatly exaggerated)



DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 3, PA.

DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

humidity



Consistent temperatures between 60° and 70°, and humidities between 10% and 20% R.H. were demanded by one of the nation's largest glass producers for successful manufacture of Safety Glass – where Vinylite plastic is pressed between two sheets of glass.

Kathabar delivered the required precise humidity control. Kathabar equipment supplies up to 40,000 c.f.m. of air, at constant humidities as low as 12 grains of moisture per pound. *That's real dehumidifying!*

Humidity conditioning has been eagerly accepted by the glass industry, as well as many other industries. Don't overlook humidity, one of the basic factors in air conditioning.

6 Repeat Orders Prove Superiority of →

"Humidity Engineering" with the **Kathabar** *System*

A glass and plastics industry leader has placed 6 repeat orders with Kathabar since 1947 for its production glass laminating and its research laboratory.

★ *Send for further Kathabar information today on your company letterhead.*

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

KATHABAR DIVISION

in jacketed vessels (No insulating layer of air exists between the shell and the lining).

APPLICATION

The advantages of bonding lead to steel have been known for many years, but the development of efficient and less expensive methods for accomplishing this have, until recently, been lacking. Two methods that have been put into commercial practice for manufacturing bonded lead linings on steel are described below.

The first step in bonding is preparation of the steel prior to bonding. The usual procedure is to clean it first by shot blasting so that an oxide-free surface will be exposed. This may be followed by pickling, usually in a 10 percent solution of sulphuric acid, and rinsing with water. If the bonding is done immediately after shot blasting, no pickling is required.

The steel is now ready for fluxing. Flux should be applied to the working area where the bonding is to commence and immediately prior to the bonding operation. Zinc-ammonium chloride and stannous chloride are two fluxes commonly used, in addition to several proprietary fluxes for which certain advantages are claimed.

Here are the two common methods of bonding lead to steel:

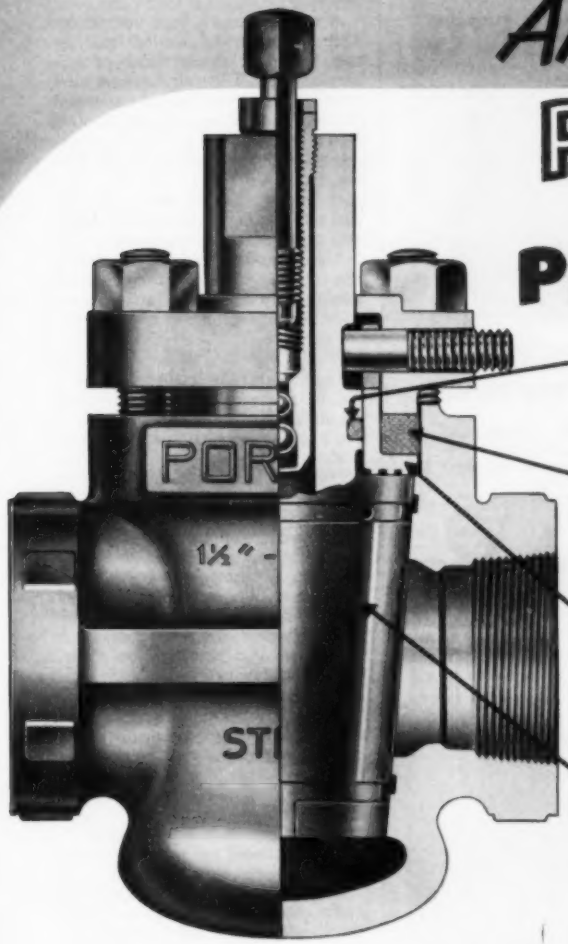
Burning Bar Method—Probably one of the earliest methods of bonding lead to steel and one which is still in use today is the burning bar method. It begins with preparation of the steel in the manner described above either as a unit or in sections. Then lead is melted from a burning bar onto the prepared steel surface by using a hand operated lead burning torch.

This procedure is used to advantage in bonding small areas and irregular shapes. After building up the lead layer to slightly more than the thickness desired, the lead is peened, scraped, or its surface otherwise made uniform.

Pouring Method—Improvements in methods of pouring lead on steel have made this method of bonded lead manufacture an efficient and also less expensive one. The method consists first of preparing the steel surface usually in the form of a large plate by the methods described above. Molten lead is then carefully poured on the heated steel surface. After solidification, the steel with the bonded lead lining is often rolled in a conventional rolling mill to compress the lead and curve it to shape. On heavy curved sections or irregular castings, the lead is cast in overlapping sections by partially rotating the vessel after each pouring. In either case, the lining is

It Costs No More to Have All FOUR in—

PORTER *Lubricated* PLUG VALVES



O'RING, under initial compression, seals against inner and outer surfaces preventing leakage past shank of valve.

Large, square RESILIENT PACKING permits high initial compression. Completely enclosed in metal, it is free from all moving parts insuring longer packing life.

"LABYRINTH" SEAL between bottom of gland bushing and top of the plug face. This grooved design provides a much more effective seal than that obtained by a single surface, it's actually a triple seal.

Two vertical LUBE GROOVES 180° apart, and two connecting horizontal grooves. The products being handled never come in contact with the lube grooves.

You will find that PORTER Lubricated PLUG VALVES are easy to install, easy to open and close, provide positive control, require less maintenance and stay in operation longer.

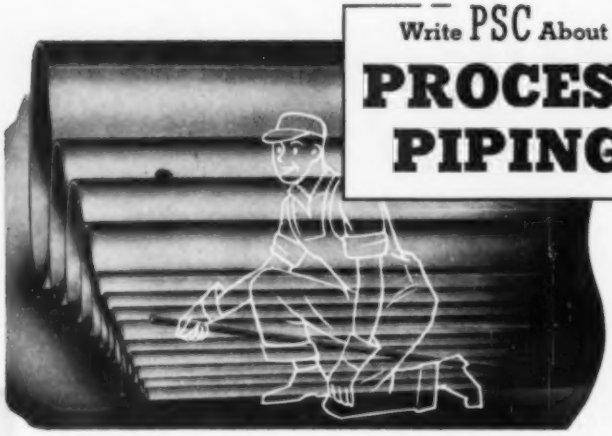
Illustrated Catalog available, showing dimensions, list prices and accessories. Please request it on your company letterhead. Of course it's FREE.

PORTER "Better Built" EQUIPMENT

H. K. PORTER COMPANY, INC.

VALVE DIVISION

DRAWER 2650 TULSA 1, OKLAHOMA



Write PSC About

PROCESS PIPING

Fabricated from Complete Range of Alloys, Any Diameter Up to 60", and in Any Shape

PSC welded process tubing is furnished in any alloy whatsoever. This feature accounts for its wide application in meeting the unlimited variety of heat, corrosion, oxidation conditions in process plants.

Any diameter up to 60"; wall thicknesses to 3/8"; temperatures to 2200°. Precision fabrication of tubing assemblies is a specialty. Send b/p or write as to your needs.

THE PRESSED STEEL CO., 707 N. Penna. Ave., Wilkes-Barre, Pa.

PSC

Custom Fabricators for the Process Industries Since 1928. Send Your Blue Prints

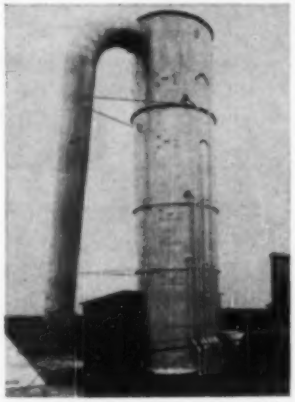
SAVE ROOF MAINTENANCE COSTS— INSTALL A MULTI-WASH SYSTEM

SAVES ON PLANT MAINTENANCE

Roof maintenance and deterioration of stacks, gutters and other equipment can become a costly item. With the elimination of air laden with destructive dust and acid producing vapors or fumes, this alone can very easily justify the expense of a Multi-Wash system.

SALVAGES BY-PRODUCTS

Often materials of value are dissipated into the air, many concerns have collected those materials for extra profit or reuse through the Multi-Wash method. Many times the cost of the Multi-Wash installation have been returned to the plant through such salvage operations.



This special Multi-Wash Collector was designed for multiple liquid operation to remove several gaseous contaminants.

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 502, Roosevelt Annex
Detroit 32, Michigan

SCHNEIBLE
MANUFACTURERS • ENGINEERS • CONTRACTORS

PRODUCTS:
Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

then scraped with special tools until a uniform thickness is obtained. Peening may or may not precede the scraping.

A new method has been successfully adopted for testing bonded lead linings to detect the presence of unbonded areas. The completely bonded vessel is sealed and heated internally by means of an appropriate hot air blower system so as to raise the temperature of the shell to about 400 deg. F.

If any non-bonded areas are present, a thin film of air trapped in this area expands and raises a conspicuous bubble in lead. It is a simple matter, after cooling, to inspect the vessel for the presence of bubbles and re-bond these areas by hand.

LEAD PIPING AND COILS

Lead is readily extruded into a variety of shapes and sizes and large quantities of extruded lead are used in the plating, chemical and related industries principally as pipe for conducting corrosive solutions and as cooling or heating coils submerged in corrosives. Sizes are limited only by the extrusion equipment avaliable and may include wall thicknesses of any size and cross-sections of practically any shape. The largest commercial lead extrusion currently made is 12 in. inside diameter.

Joints in lead pipe may be of the Van Stone type made by butting together flanged sections and securing them with two bolted cast iron or steel slip-on flanges. They may also be butted together and welded. In the case of vertical pipe, sections are joined with a "cup" joint. In this type joint, the lower section of pipe is flared out and the upper beveled to fit into the flared end where it can be welded.

Lead pipe coils have found widest acceptance for cooling purposes, chiefly because of lead's corrosion resistance and the ease with which it can be formed. Lead coils usually are helical in shape but may take other forms and are constructed of extruded lead pipe. Flat coils for the ends and bottoms of the tanks are also used. Pipe extruded with a fluted or ribbed cross-section for greater surface area is commercially available.

One of the latest lead coil developments is a heat exchanger consisting of two lead pipes, one within the other. The larger pipe has an inside diameter of 2 in. with ¼ in. wall and is extruded from 6 percent antimonial lead. The inside pipe made of soft lead is 1 in. diam. with a ¼ in. wall at the thin portion. The exterior of the inner pipe has

been extruded in the shape of a six-pointed star to provide extra support and also to retain concentricity. The pipes were designed so that the area of the space between the two is approximately equal to the cross-sectional area of the inner pipe. After extrusion the coil was assembled by inserting the smaller pipe into the larger and coiling both into units 11 ft. in circumference and 27 coils high. The unit performs the dual function of cooling a solution circulating between the two pipes and heating another solution circulating through the inside pipe.

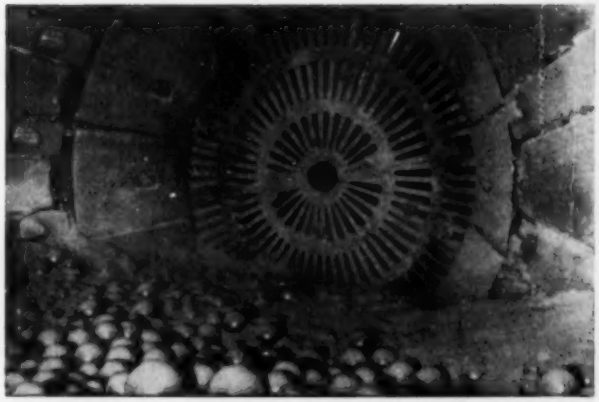
Because of lead's weight, it is frequently advisable to support it over long spans either with strap hangers or by laying it in steel channels or by using lead lined pipe. Steel or iron pipes lined with lead are used to advantage when pressures exceed 50 lb. steam (298 deg. F.) or the expense of supporting the pipe by other means is disproportionate. Lead lined pipe is commercially available from 1 in. to 12 in. in diameter, the lead lining thickness ranging from $\frac{1}{16}$ in. to $\frac{1}{8}$ in.

BONDED LEAD AND LEAD COVERED PIPE

Bonding techniques similar to those described above have been utilized in the manufacture of lead lined steel pipe and lead covered copper pipe. In all cases the purpose is the same: to utilize lead's corrosion resistance in combination with the strength of steel or copper. In making bonded lead pipe a length of steel is first cleaned and fluxed. Then molten lead is cast on in sections by rotating the pipe. A second method uses instead of molten lead, a length of extruded lead pipe which is inserted inside a properly prepared pipe of steel. The ends of the lead pipe are sealed and steam pressure applied to expand it against the outer pipe. Pressure is raised until the temperature reaches the point where bonding takes place between the lead and steel, aided by pre-tinning the steel with a thin solder film.

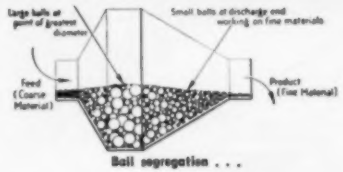
Solder bonded lead lined steel pipe is recommended when design or operating conditions involve temperatures up to 250 deg. F. vacuum, high pressure, vibration or physical shock and, of course, the handling of corrosive chemicals. Pipe sizes range from $\frac{1}{2}$ in. I.D. to 12 in. I.D. with lead lining thickness either $\frac{1}{8}$ in., $\frac{1}{16}$ in. or $\frac{1}{4}$ in.

Lead covered copper and steel pipe is made somewhat like bonded lead lined pipe except that the lead layer is on the outside instead of the inside. The pipe in length of about 10 ft. is cleaned and fluxed and mounted centrally in a circular split mold. Molten lead is poured around the pipe until it is completely covered. The pipe is finished by drawing it through a

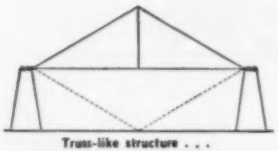


NATURAL BALL SEGREGATION

Here's what you see inside a Hardinge Conical Ball Mill. This unretouched photo shows the discharge end of the mill. Notice that all the large balls are in the foreground, near the feed end of the mill (where they belong for most efficient grinding).

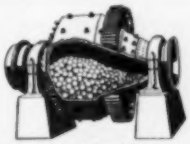

Large balls at point of greatest diameter
Small balls at discharge end working on fine materials
Feed (Coarse Material)
Product (Fine Material)

Ball segregation . . .



Truss-like structure . . .

No dead corners . . .



Less dead weight.

Write for Bulletin 17-B-11 for dry grinding; AH-389-11 for wet grinding.

The Conical Mill was pioneered by Hardinge 44 years ago. There are that many years of grinding "know how" behind it.

The principle of the Conical Mill is sound. Note that the longitudinal cross section forms a truss. Strength is obtained without massive construction. Excessive dead weight, extra power and high operation costs are eliminated.

Balls, and material, are segregated by size, becoming progressively smaller toward the discharge end. Thus grinding energy is roughly proportional to size of material ground.

HARDINGE
COMPANY INCORPORATED

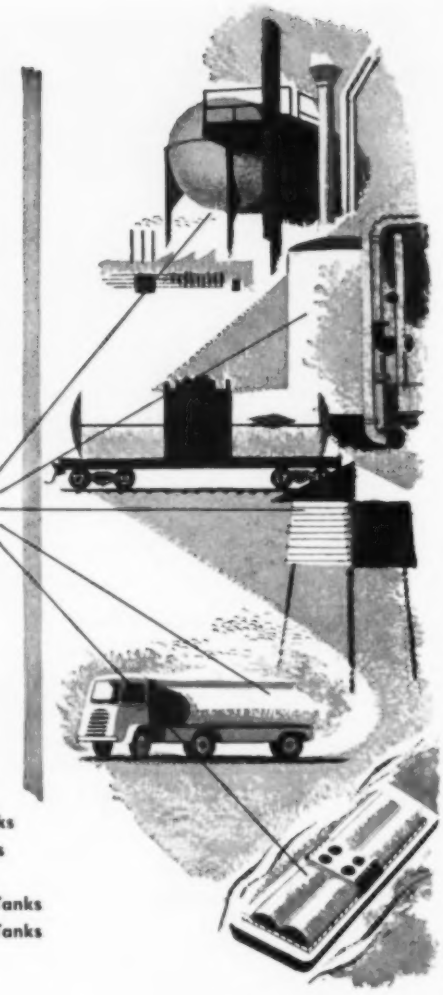
YORK, PENNSYLVANIA—240 Arch St. Main Office and Works

NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1
122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.

cut corrosion costs

with

SARAN RUBBER TANK LINING



in **Storage Tanks**
Tank Trailers
Tank Cars
Processing Tanks
Production Tanks

Increase the life expectancy of costly equipment with saran rubber tank lining. The high degree of both chemical and abrasive resistance makes saran rubber an outstanding lining where resistance to grease, many solvents, acids and other chemicals is required.

Saran rubber can be applied easily and economically by experienced tank lining applicators located strategically throughout the country. Investigate this superior tank lining today. Contact your nearest Saran Lined Pipe Company office and find out how you can add years to the life of your costly equipment.

Write to the Distributor:

DEPARTMENT PL. 201

Saran Lined Pipe Company

2415 BURDETTE AVE. • FERNDALE, MICHIGAN
Offices in: New York • Boston • Philadelphia • Pittsburgh
Chicago • Tulsa • Indianapolis • Houston • San Francisco
Los Angeles • Portland • Cleveland • Denver • Seattle
Charleston, S.C. • Toronto

SARAN RUBBER
DOW
PRODUCT

drawbench to bring the lead down to the thickness desired. By other techniques, continuous lengths up to 100 ft. can be made.

Lead covered copper coils can be operated up to 150-lb. steam pressure, while ordinary lead steam coils can operate successfully only up to 50-lb. steam pressure. This is the reason why lead covered copper has found such wide acceptance for use as heating coils. Copper absorbs and transfers heat with the greatest efficiency of the common metals and because lead is bonded directly to the copper with no air interface, heat transfer in lead covered copper piping is maintained at its highest value. Because the physical strength to withstand high steam pressures is provided by the copper, it is practical to keep the thickness of lead covering at a minimum; thus the combined thickness of copper and lead is materially less than the wall thickness of lead pipe for the same application.

Formula for calculating the theoretical over-all coefficient of heat transfer for bonded lead covered copper:

$$U = \frac{1}{\frac{X}{K} + \frac{1}{h_1} + \frac{1}{h_2} + \frac{Y}{K_1}}$$

Where:

U = theoretical over-all coefficient heat transfer coefficient, Btu./hr./sq. ft./°F., K = conductivity of lead wall per in. (use 240), K_1 = conductivity of copper wall per in. (use 2680), X = thickness of lead wall in inches, Y = thickness of copper wall in inches, h_1 = steam film (use 1,000), h_2 = liquid film (use 300).

Formula for calculating the area of heat transfer surfaces for bonded lead covered copper:

$$A = \frac{H}{U \times \Delta T}$$

Where: A = area of heat transfer surface in sq. ft., H = total heat load, Btu. per hr., U = overall rate of heat transfer, Btu./hr./sq. ft./deg. F., ΔT = mean temperature difference between the hot and cold fluids, in deg. F.

For heating coils:

$$\Delta T = \text{Steam temp. (°F.)} - \left(\frac{\text{starting} + \text{finished temp. of sol.}}{2}\right)$$

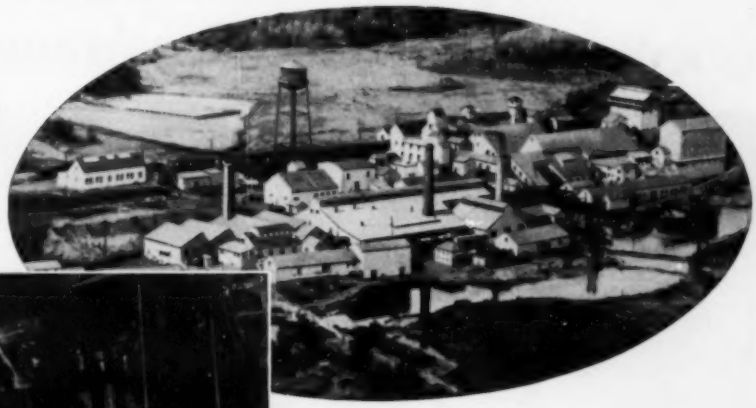
For cooling coils:

$$\Delta T = \left(\frac{\text{starting} + \text{finished temp. of sol.}}{2}\right) - \text{Cooling water temp.}$$

Lead bonded steel coil support legs are commercially available to eliminate the sagging of cast lead legs after prolonged operation at elevated temperature. —*End*

TAKE *Lectromelt* FURNACES TO YOUR ORE AND SAVE ON TRANSPORTATION

Deloro Smelting & Refining Company, Ltd., employ three Lectromelt Furnaces here at Deloro, Ontario.



• This 150 kva. Lectromelt Furnace is smelting cobalt concentrates. Total charge 6-7 tons per day.

Silver concentrates are treated by this 100 kva. furnace at the rate of 3½ to 4 tons of charge per day.

Cobalt alloys are melted and refined in this 250-pound lectromelt furnace. Another similar furnace is being added.

You have electric power at the mine site. Why not locate Lectromelt* smelting furnaces there and avoid long, expensive hauls of bulky ores? You'll doubtless be money ahead.

Lectromelt Furnace equipment is dependable and long lived, so it can safely be installed away from service centers.

Our engineers are familiar with the use of electric arc furnaces for smelting, refining and melting operations. They can help you select the Lectromelt equipment you need and will advise on the designing of your furnaces. For Bulletin 104 telling you more about these furnaces and services, write Pittsburgh Lectromelt Furnace Corporation, 325 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Brasseux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

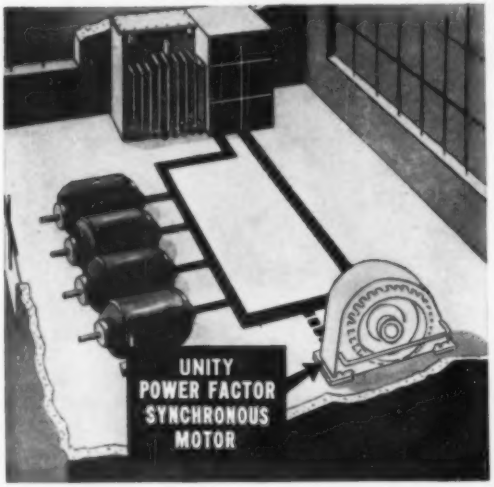
MOORE RAPID

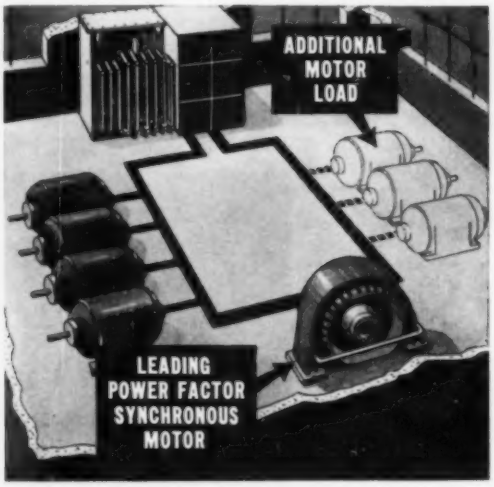
WHEN YOU MELT... *Lectromelt*

50 K.V.A. TO 50,000 K.V.A.

How to get more out

. . . . *install G-E Synchronous Motors*





If your plant power system is loaded close to full capacity and you have a place where a large constant-speed motor can be used, you may be able to install a *unity power-factor* synchronous motor without increasing the kva load on your system.

Or, if your power system is already overloaded, then a *leading power-factor* synchronous motor can actually supply kvars to your system while performing its usual drive duties. Then you can often install additional inductive apparatus to an existing system without fear of overloading feeder lines.

If you are planning plant expansion or you need more motors and/or suspect power system overloading, contact the nearest G-E sales engineer. He'll help you survey your system, and help you determine the type of synchronous motor you need—should this be one answer to your power system problems. *General Electric Company, Schenectady, N.Y.*

NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—$100. Call or write your nearest G-E sales office, or send for free copy of 96-page instructor's manual.

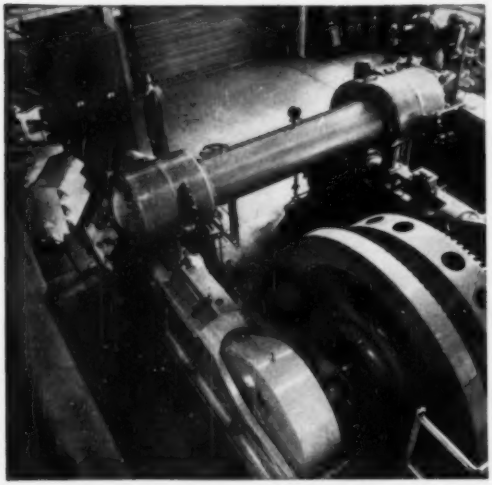
Look at the scope of this Course

1. Fundamentals of Motors
2. Types of Motors
3. Fundamentals of Selection
4. A-c Induction Motors
5. Single-phase Motors
6. D-c Motors
7. Synchronous Motors
8. Adjustable-speed Drives
9. Gear Motors

GENERAL ELECTRIC

# of your power system

for unity and leading power-factor drives

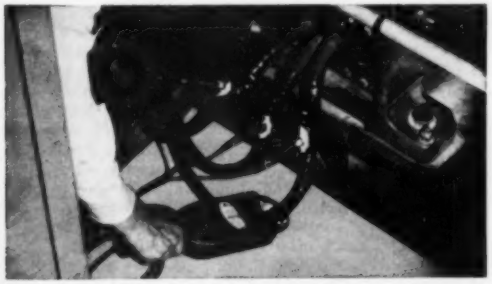


Control, too, will protect your system—G-E Limitamp high-voltage control provides ample interrupting capacity, protection for operating personnel, good appearance, and compactness. Here it controls and protects a 350-hp G-E synchronous motor.

G-E SYNCHRONOUS MOTORS ARE DRIVING . . . .

pumps	*saws*
compressors	*generators*
Jordans	*rolling mills*
beaters	*pulp refiners*
crushers	*chippers*
ball mills	*flour mills*
tube mills	*stock refiners*
large conveyors	*line shafts*
blowers	*fans . . . .*

in all types of industries where their efficiency, low first cost, and reliability make them exceedingly popular.



Check power factor on individual circuits—easily, quickly—with new G-E hook-on power-factor meter. This portable instrument hooks around the line—no cutting of conductors, no costly shutdowns to make power checks. You can accurately locate those circuits where corrective action is needed.

General Electric Co. Sect. AG 770-25
Schenectady 5, N. Y.

Please send me the following literature. . .

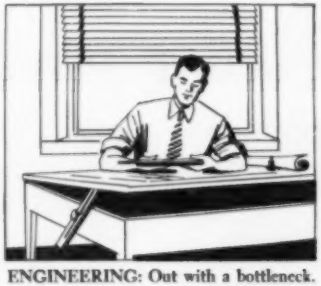
- ☐ for reference purposes
- ☐ for planning an immediate project

( ) GER-234—Synchronous Motors Do Two Jobs at One Time
( ) GEA-5332—Low-speed Synchronous Motors
( ) GEA-5426—High-speed Synchronous Motors
( ) GEA-5469—G-E Testing Instruments
( ) GEZ-310—Motor Training Course Instructor's Manual

Name .....
Company .....
Address .....
City ..... State .....

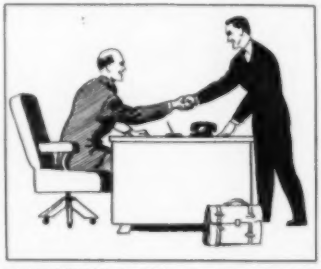
mail this coupon today

RESEARCH: A challenging assignment.



ENGINEERING: Out with a bottleneck.

PLANT: Trouble shooting at all hours.



TECHNICAL SALES: Customer service.

Diary of a Technical Trainee

Jefferson Chemical Co. has every reason to be proud of its comprehensive training program. To document that here is a step-by-step case history of Paul Stilson, a hypothetical chemical engineer who is a composite of the first two men to complete the course.

JOHN J. GLOVER and HAROLD R. HORNER

NOTE: *The raft of articles and papers on the subject of training programs have come from executives, personnel managers and employment counsellors. By way of contrast, the account below has been written by the trainees themselves. It shows, we believe, how a company can profit from a first-rate training program.*—EDITOR.

PAUL STILSON, graduate student was interviewed by a recruiting team from Jefferson Chemical Company, Inc. These gentlemen explained their company's training program: six months in technical work at each of the three locations of the company (18 mo. in all), followed by another six month period, broken up into short assignments mostly in non-technical groups.

Specifically, the program consisted of (1) research at the Austin, Tex., laboratories; (2) engineering in the New York City office; (3) plant work at Port Neches, Tex. These 18 months were followed by a final six months back in New York, and broken up as follows: two months in technical sales service and one month each in the operating division, budget division, estimating section, and in special technical studies. Lastly, an extra two weeks were spent in the traffic department.

Paul thought it looked like a wonderful foundation for a career. But more important from an immediate viewpoint, he would get plenty of opportunity to see what type of work he liked best and what he could do best.

Subsequently, Paul visited the New York office of Jefferson, talked with people in all of the departments in which he would be working. He received an offer of a job and accepted it.

JULY-DECEMBER '49, RESEARCH

After graduation, Paul reported to the research facilities at Austin, Tex. There he was given a current problem in process development. After familiarizing himself with the process, Paul went to work on one phase of it—finding a means to separate a reaction mixture.

Centrifuge had been used on small (5 liter) runs, but before going to larger runs, another means of separation had to be found. Filtration had not been too successful up to this point, but it seemed to be the answer.

Paul tried various ways to filter the mixture. His first action was one of conservation. The filter in use had a 6-in. diameter filter cloth. This meant a large amount of the reaction mixture for each test. To reduce this amount, Paul took time out to design a smaller filter which proved to be quite satisfactory. Other problems were met and solved and, eventually, large-scale (50 gal.) runs were made.

From this and subsequent assignments, Paul received several distinct impressions. He was pleased to note that he was allowed to work with very little supervision and that the problems of the job were largely left to his own initiative and resourcefulness. Another observation was the interest everyone showed in doing his job well, in contrast to some students who were interested in doing only enough of their studies, projects or jobs to get by.

Another eye-opener was the interest—almost excitement—Paul found in research. Before entering industry, he had the idea that research and dull, routine analyses were synonymous. Actually the work was a constant challenge as was the job of supervising three or four non-technical operators.

JANUARY '50-JUNE '50

After Austin, Paul went to the engineering division in the New York office. He spent the initial period familiarizing himself with the various short-cut and standard methods used

John J. Glover is in technical sales service in the New York office of Jefferson Chemical Co.; Harold R. Horner is in production in the Port Neches plant. Both are chemical engineers with the distinction of being the first two men to complete the training course described.

Notice how the inner facing of the Lunkenheimer ring seats squarely against the body wall. There's no flange or shoulder where corrosion can work its way inside — no bending that causes leakage.

This end-seated Lunkenheimer ring *stays put* — won't warp out of place or twist away from the body as it is tightened. See how firmly the heavy ring seals itself into the wall, becoming an integral part of it, adding *extra* strength at the "nerve center," guarding against corrosion.

And this ring actually seats more tightly with years of wear.

Should you ever need to replace it — heavy lugs inside the ring make renewal simply a matter of screwing the old one out, the new one in . . . quickly, without serious production delays.

Before you approve that next order for steel valves in your plant, be sure to double-check seat ring construction. For longer life and lower maintenance costs, specify Lunkenheimer steel valves . . . with *shoulder-less* seat rings.

Write today for your copy of "Lunkenheimer Cast Steels," an informative 52-page brochure on the development and application of steel valve alloys. *The Lunkenheimer Co., Box 360P, Cincinnati 14, Ohio.*

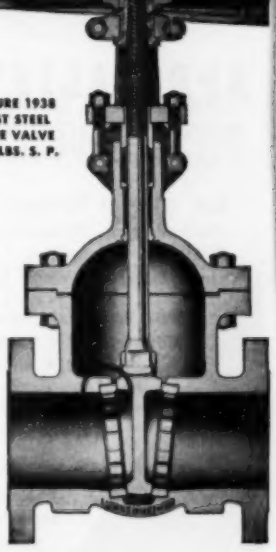


FIGURE 1938
CAST STEEL
GATE VALVE
300 LBS. S. P.

STEEL • IRON • BRONZE

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-491-A

Only 3 MOVING PARTS *in the* HENSZEY *Indicating* FLOW METER

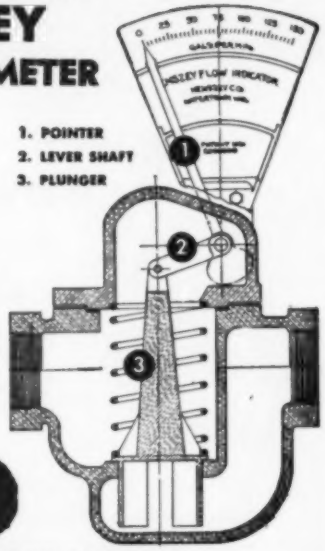
Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

For Details Consult Sweet's Catalog or Write

HENSZEY COMPANY
Dept. E-1, WATERTOWN, WISCONSIN



HENSZEY

Indicating **FLOW METERS**

Continuous Blowdown • Distillation System • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

SPECIALISTS in PIPE FABRICATING

TO MEET THE MOST EXACTING SPECIFICATIONS

Butt Welds • Bending All Types • Coiling
Machining • Threading • Beveling • Lining
Pickling • Galvanizing • Sand Blasting • Preheating • Stress Relieving • Testing.

PIPE—Wrought Iron—Steel • Structural Cast Iron
Copper Steel • Seamless • Electric Weld Spiral, Lap
Butt Weld • Shore Dredge • SPEED-LAY.

PILING—Sheet piling, lightweight —Tubular—all size.

PILE FITTINGS—All types and sizes for steel and wood.

For Oil, Chemical, Concrete, Asphalt and other Industrial Requirements, ALBERT "Rings the Bell."

ALBERT
PIPE SUPPLY CO.
BERRY AT NORTH 13th STREET
BROOKLYN 11, N. Y.

in heat exchanger rating, pipe sizing, fractionating tower design and similar recurring problems.

Paul was also assigned to work with one of the experienced job engineers on an addition to the plant. The problem was to provide a surge system for a gaseous raw material so that a reserve of the material would be ready for instantaneous use when needed. As the situation stood, the installation involved was forced to shut down each time there was an interruption in the output of the raw material.

The project was small enough for Paul to have a hand in all the design work but also large enough to have diversified equipment. He was able to apply his previous training in designing heat exchangers, compressors and pressure vessels. The job also gave him an introduction into the complexities of piping layout and equipment location.

Paul found it necessary to study various equipment catalogues and talk to salesmen about the equipment that would be suitable for this particular application.

As it turned out, the installation appeared to be over-supplied with control instruments. In fact, several people, not knowing Paul had had a hand in the project, confided to him the opinion that it was just an engineer's dream with no practical use. They said it would probably take an instrument man full time just to keep the instruments working. Later, the equipment was installed and successfully operated. The gloomy prediction about the operating problems inherent with a high instrument-to-equipment ratio (26 instruments to 10 pieces of equipment) turned out to be false.

In addition to his technical training, Paul learned some very important lessons in teamwork. He found, for instance, that the research engineers were prone to be critical of the process engineers and vice versa. This is a common occurrence in most companies and comes, basically, from a lack of appreciation on the part of one division for what the other division contributes—the sort of shortcoming that job rotation is designed to correct.

Paul's experience in each of the divisions gave him the background to clear up some of the misunderstandings, but only after learning many lessons the hard way. He found that, in his own research work, he could have made the job of the process engineer quite a bit easier by thinking ahead.

For instance, Paul could have obtained some specific gravities of various solutions quite easily while at the

laboratories. In his filtration work, he made runs (50 gal.) that were similar to the runs required in a full-size unit but his data on filtration pressures were incomplete. Complete material balances around the filter could have been made fairly easily, but he made only one. In all these instances it later meant sending special requests to the Austin laboratories to supply missing data.

On the other hand, the design engineers were often not aware of the time necessary to perform what appeared to be a simple laboratory test.

Some of the engineers couldn't see why Austin hadn't developed many new products. They thought that growth of the company hadn't been up to potential for this reason. They just did not appreciate the time required to come up with a new product.

With Paul's background of experience he will, undoubtedly, be able to promote better understanding between the two groups.

After concluding the engineering assignment, Paul was transferred to Port Neches, Tex., for six months of plant experience. By this time he had a rough understanding of the operation and layout of the plant. Having worked with flow diagrams of the process units while in engineering, he was very interested in seeing the units in operation.

The plant assignment was broken into two periods, three months in the process engineering division and three months in actual operations. As a process engineer, Paul did trouble shooting in the units and studied the feasibility of various proposed projects in connection with increased production. He also worked with other process men who were making similar studies.

By the time Paul had completed six months at the plant, he was thoroughly indoctrinated with the fact that you must keep the units operating. You can't lose production just to run a few tests to obtain data for a small project. On the other hand, if there is any reason to believe that there is an unsafe condition existing, the units should be shut down immediately to correct such a condition.

Paul was fortunate to be at the plant during negotiations for the labor contracts. Having spent considerable time in the units, he had heard the viewpoints and problems of the operating and maintenance men. Management's viewpoints and problems were explained by the plant manager in regular meetings with supervisors. Having heard the views of both management and the men, Paul was able to appreciate the problems of labor contract negotiations.

He had learned one valuable lesson

solves your
extraordinary
corrosive pumping problems

extra **CORROSION ALLOWANCE** ... All Pacific Process Pumps are custom-built with the case casting thickness in excess of the actual pressure-temperature requirements. This provides a liberal allowance for corrosion-erosion and a high safety factor.

extra **HEAVY CONSTRUCTION** ... Pumps are developed to combine the strength necessary for continuous heavy duty service with the simplicity and accessibility for low maintenance cost. All parts in contact with pumped liquid may be fabricated from any commercially available ferrous or non-ferrous metal.

extra **CAPACITY** ... Types SVC and SEC single-stage Process Pumps handle liquids from sub-zero to 800°F.; 15 to 1600 gpm; 500 to 600 psig pressure; heads up to 600 feet; speeds to 4,000 rpm. Type RVC two-stage Process pumps handle liquids from sub-zero to 850°F.; to 600 psig pressure; heads to 825 feet; speeds to 3,600 rpm. All 3 types available with suction diameter from 1½" to 8"; discharge diameters from 1" to 6".

Write for Bulletins 101 and 108

Pacific Pumps inc.

PACIFIC Precision Built PUMPS

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

CP-3

TABER for Higher **PRACTICAL** Performance

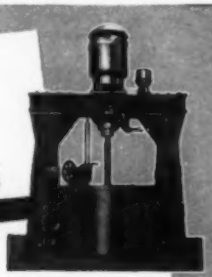
SULPHURIC ACID PUMPING

CONCENTRATED SULPHURIC ACID is best handled by Taber Vertical Type Pumps especially built for this purpose of cast iron and steel. For handling 20% **Oleum** same type of Vertical Pump is successfully used when made of steel. "**Mixed Acids**" have been handled very successfully with steel vertical type pumps. • Taber Vertical Design eliminates all stuffing Box Leakage because Stuffing Box is located above liquid level. Bearings are of liberal dimension so as to increase duration of performance. • These pumps are also built of special alloys when such alloys are obtainable and approved by National Production Authority, whose approval is required, and determined by END USE of product manufactured. Therefore, if you have need for special alloy pumps, be sure to state the END USE. • Please use business stationery when writing for BULLETIN V-837.

TABER PUMP CO. *(Est. 1859)* 293 Elm St., Buffalo 3, N. Y.

TABER PUMPS

Fletcher Motor-Driven Suspended CENTRIFUGALS



3 Ways Faster — All-ways Safe

Yes, the Fletcher features high speed at every step to assure maximum production . . . most economical operation. Great structural strength and superior design insure perfect safety at all times. Other features provide largest capacity in proportion to basket diameter; large bottom discharge opening for solids; unbalanced loads easily handled. So for Filtering, Separating or Clarifying . . . get a Fletcher. Our catalog "Fletcher Centrifugals for the Process Industries" gives all the facts. Send for a copy.

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 235 GLENWOOD AVE., PHILADELPHIA 40, PA.

in human relations: if a man has a complaint, it is a serious matter with him, even though it may sound trivial to someone else. In many cases, a complaint can be settled just by letting a man tell it in his own words.

JANUARY-JUNE '51, GENERAL

The final six months of the program might be crudely compared to a finishing school for debutantes. The training in research, engineering, and plant operations had left some gaps in Paul's knowledge of the over-all company operation and this last group of assignments was designed to fill in the gaps and to put the final polish on the trainee.

Two of the final six months were spent in the sales department. Paul worked with the technical sales service division because it fitted in best with his experience and the work was such that he could become familiar with the other four sales department divisions: sales, commercial research, market research, and market development.

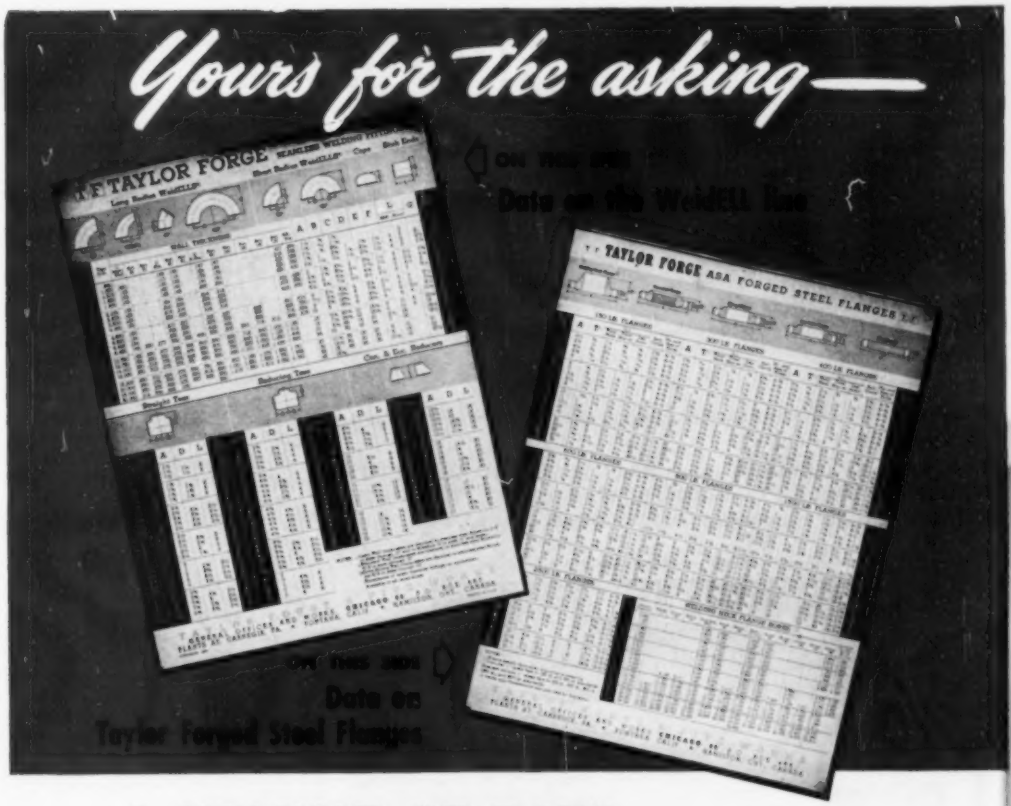
Up to this point, the training program had been closely allied to Paul's background but it was necessary to give Paul some formal assignments while in the sales department. Even though he was working in close relationship with the men in the other four divisions of the sales department he could not obtain a complete understanding of their duties and functions in the company organization without more formal indoctrination.

As part of his introduction to technical sales service, Paul was instructed in the fact that not only does the sales department want to sell the company's products, but that it wants to keep them sold. To do this it is necessary to maintain good customer relations and to supply each customer with all possible technical assistance. It is also necessary to keep the specifications of the products high to keep in competition with similar products on the market.

The necessity for close cooperation between sales, production and research was becoming more apparent to Paul during this final portion of the training program. The actual mechanics of the transfer of information between plant production and sales and New York production is handled by the operating division where Paul spent his next month.

While there, he attended the weekly sales-production meetings. These meetings and subsequent work after them, illustrated the relationships among sales, volumes, market conditions, supply of raw materials, technological limitations of the equipment, and operation of the plant.

Yours for the asking—



A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME_____

POSITION_____

COMPANY_____

STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

313—0152

WIRE MESH

Maybe it all *does* look pretty much the same at first glance. But when a firm has been making wire mesh for 70 years man and boy, there's bound to be a little more to it than meets the eye—a little more know-how in engineering and weaving, a little more quality in the product, a little more service and satisfaction for the user.

JELLIFF WIRE MESH is woven in all ductile metals
JELLIFF WIRE MESH is woven in all commercial weaves
JELLIFF WIRE MESH is woven in widths up to 72 inches
JELLIFF WIRE MESH is economical. Every foot runs true to the specifications.

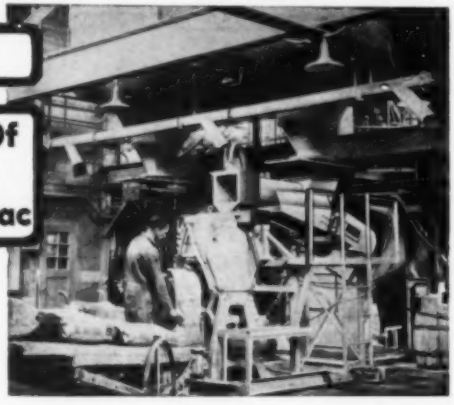
★ ★ ★ ★

JELLIFF WIRE MESH is a quality product and has been for 70 years. You can depend on it.

Write today for full details about JELLIFF WIRE MESH, JELLIFF WIRE MESH PRODUCTS, and JELLIFF'S CONSULTATION SERVICE on wire-mesh engineering. Address Department 15.

THE C. O. JELLIFF MFG. CORP.
DIPPING BASKETS · LEKTROMESH · RESISTANCE WIRE
WIRE MESH PARTS · WIRE CLOTH · STRAINERS · FILTERS
SOUTHPORT CONNECTICUT

Efficient Feeding Of Sal Ammoniac



This Syntron F-45 Feeder provides a smooth, even and controllable flow of Sal Ammoniac to a sack filling machine.

SYNTRON
VIBRATORY FEEDERS

WILL HANDLE most all types of bulk materials—fine, abrasive, lumpy, hot, cold, dry, damp. **AT** variably controlled rates from pounds to hundreds of tons per hour. **TO** mixers, driers, ovens, crushers, belts, screens, packaging and bagging machines, etc. **WITH** very low maintenance costs due to absence of motors, pulleys, eccentrics, cams, gears and other wearing parts.

Write To—

SYNTRON COMPANY
610 Lexington Avenue Homer City Penna.

Not only does the operating division act as the liaison between the New York office and the plant, but it also aids the plant on the numerous operating problems that arise. In this connection, Paul was able to supply much useful information.

During the next one-month assignment in the general administrative department Paul worked in the budget division. His work here brought him face to face with some of the working tools of higher management. Such items as balance sheets, income statements, and the like were things he had heard about but knew only slightly. After working with these to develop reasons for certain costs fluctuating above or below the budget Paul was soon able to understand them.

The final two months of the program were spent with the technical group of the research department and the estimating section of the engineering division. One of the important functions of the technical group is to work up initial investigations on proposed projects. These projects are either rejected or retained for more detailed study on the basis of the findings of the initial investigation. If the proposed installation appears attractive, the engineering division makes a detailed study of the process and the sales department prepares a market survey. The estimating section may then prepare a more detailed cost picture.

Paul's training also included a two-week stay in the traffic department. He had never really been sure of what they did except that their work was related to the transportation of products and raw materials. He was surprised to find that looking up a freight rate was quite involved and not as simple as finding the cost of a train ticket from New York to Boston. His training here also included a study of the methods for selecting routes and for tracing tank cars.

This ended the training program. At this point Paul was asked to indicate his preference concerning a permanent assignment. He had been told that after his two-year apprenticeship, permanent assignment would be made with consideration given to his own choice.

You may wonder what latitude Paul was permitted in choosing his assignment. There was no limitation upon what department or division he could choose. In fact he could make the choice as specific as he liked. Of the first two trainees to complete the program, as represented by Paul, one went into technical sales service and the other into plant production work.

—End

TANNING CO. INCREASES PRODUCTION 25% WITH

STERLING SPEED-TROL!

By replacement of constant speed motors on our tanning drums with Speed-Trols we were able to select the most efficient speed for each type and condition of skin with the result that we increased production 25%, reduced spoilage 15% and noticeably improved the quality of finished skins, reports Mr. Anthony Ruzicka, Plant Engineer for Johnstown Tanning Corp., Johnstown, New York, specialists in the tanning of reptile skins.

STERLING SPEED-TROL GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

EQUIPMENT ADAPTATION TO: Sequence synchronization—operators' abilities—load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

PROCESS CONTROL OF: Temperature—viscosity—level—pressure—flow—etc.

TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality and profit.

OTHER STERLING ELECTRIC POWER DRIVES:

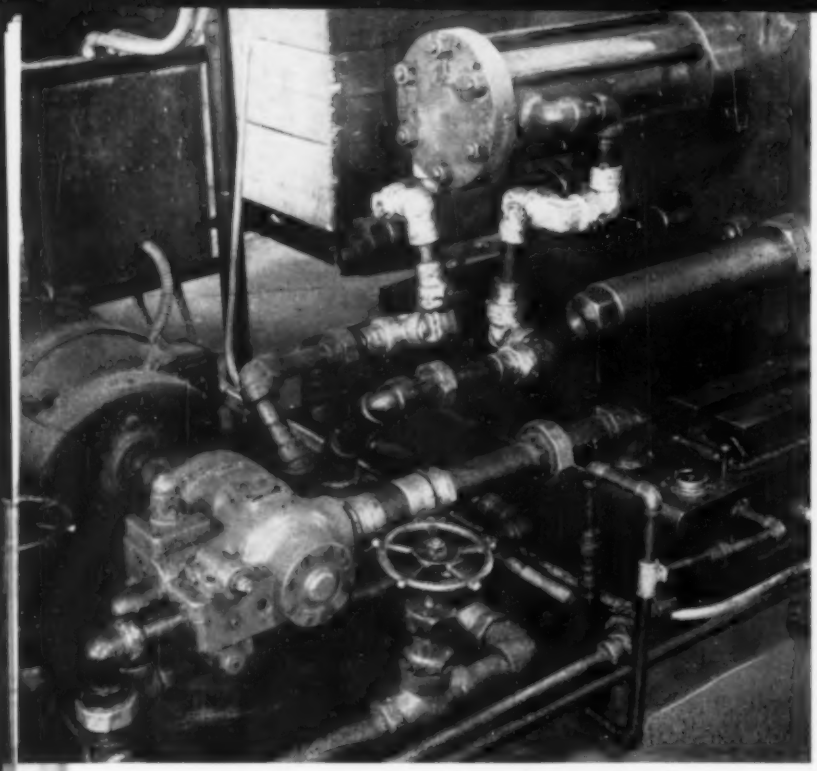
- **STERLING SLO-SPEED (GEARED) MOTORS**
- **STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS**

DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. **A-119**

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.
Offices and distributors in all principal cities.



5 years, no change of oil

THIS midwestern die casting company called in a Standard Oil lubrication specialist when operations were started over five years ago. One of his recommendations specified the use of STANOIL Industrial Oil No. 18 in the hydraulic unit of the die casting machine shown. Now, after five years of service, this original oil is still in nearly perfect condition. There is no deposit and no varnish in the hydraulic system. There has been no need to clean the system.

This performance is typical of the results gained by STANOIL users who count on its greater oxidation stability and corrosion resistance to deliver trouble-free lubrication in speed reducers, head stock gears, auxiliary turbines, and compressors, as well as hydraulic systems.

The Standard Oil lubrication specialist in your own area can help put the advantages of versatile STANOIL Industrial Oil to work in your plant now. A call to your local Standard Oil (Indiana) office is all that's necessary. Why not do it today?

STANOIL
TRADE MARK
Industrial Oil

Standard Oil Company, 910 South Michigan Ave., Chicago 80, Ill.

What's your problem?

D. R. Clay, lubrication specialist at Standard Oil's Grand Rapids office, helped this manufacturer put hydraulic system lubrication on a trouble-free basis with STANOIL Industrial Oil.

One of a corps of such specialists, he makes his headquarters close to the plants he serves. He offers on-the-spot lubrication service that is backed by extensive experience and training in the application of modern lubricants and fuels. The same service is available to you wherever you are located in the Midwest through the lubrication specialist in your own locality.

Arrange today for a visit by this specialist. Just phone or write the Standard Oil Company office nearest you. When he calls, ask for actual performance data on these outstanding products:

SUPERLA Greases—Available in a wide range of consistency grades and in both lime-soap and soda-soap types, SUPERLA Greases cover a wide range of operations.

STANORUST Rust Preventives—The eight grades of STANORUST form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specially developed for its intended use. The grades range from a fingerprint remover to a heavy semi-solid that protects against corrosion for years under the most severe outdoor exposure.

STANDARD OIL COMPANY (STANDARD) *(Indiana)*

STURTEVANT ROTARY FINE CRUSHERS

Crush or Granulate to Fine, Even Sizes without Excess Dust...

Cross section view illustrating the crushing action

These rugged crushers speed output of fines, cut reduction costs. Desired fineness is quickly obtained by regulating hand wheel. "Open-door" accessibility permits fast, easy cleaning. They crush fine . . . crush fast and do not clog. Available in output capacities from 1 to 30 tons-per-hour. Write for catalog.

STURTEVANT MILL COMPANY
100-A CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

CLIP AND MAIL COUPON TODAY

Sturtevant Mill Company
100-A Clayton Street
Boston 22, Massachusetts

Gentlemen:
Please send me catalog describing your Rotary Fine Crushers. I am interested in crushing _____

Name _____

Street _____

City & State _____

Firm _____

MAN OF THE MONTH: Chalmer G. Kirkbride

Winner of AIChE's Professional Progress Award, vice president and director of Houdry Process Corp.

Chemical engineering is a profession and not just a means of making a living. Propagating that idea has been something of an avocation with C. G. Kirkbride, universally known as Kirk. That he's been pretty successful at it is born out by his recent honor, AIChE's Professional Progress Award.

Further proof of his energy and enthusiasm in this direction is the list of his AIChE activities. For example, currently he is chairman of the membership committee, representative with ECPD, active in the accrediting program, a member of the council.

He joined Houdry Process Corp. in 1947 as manager of research and development, becoming vice president and director a year later. In his work, Kirk's most evident characteristic is his insistence that attention be paid to fundamentals. Those who work with or for him know, or soon learn, than in attacking any problem, the underlying scientific principles must be thoroughly considered. He tolerates empiricism only as a last resort. One of the fundamentals he considers most important is economics. He makes it a criterion of any project. This attitude is reflected throughout his book, "Chemical Engineering Fundamentals."

He began his career in 1930 when he graduated from the University of Michigan. He was with the research department of Standard Oil (Indiana) until 1937; assistant director of research, Pan American Refining Corp., Texas City, until 1942; chief of chemical engineering development, Magnolia Petroleum Co., Dallas, until 1944; professor of chemical engineering, Texas A & M until 1947.

He has the happy faculty of being able to work with complete concentration for long periods, and then to relax and enjoy himself equally well. When he was in Texas, Kirk made an annual hunting excursion during the dove season. Now that he's located near the Maryland salt marshes, he's turned his attention to ducks.

He takes to the golf links as often as possible. It is here that his cigarette holder, usually clamped at a jaunty angle, serves a second purpose. Before the ball is addressed, the cigarette holder is placed on the ground in line with the ball and at exactly 90 deg. to the hoped for line of flight. Thus oriented, the ball is sent on its way.

A. T. McPherson. Associate director, National Bureau of Standards. Formerly chief of its organic and fibrous materials division, a post he has held since 1943. With the bureau since 1918. New chief of the organic and fibrous materials division: **Gordon M. Kline.** He continues as chief of the organic plastics section of the division.

Charles E. Kwartler. Director of product and process development, Gamma Chemical Corp. Previously, associated with Winthrop-Stearns for 13 years.

A. M. Kahn. From president to chairman of the board, Consolidated Products Co., New York. Also president of Acme Hamilton Rubber Co.

M. E. Spaght. New member of Stanford Research Institute's board of directors. President of Shell Development since 1949. Member of SRI's technical advisory committee since its formation in 1950.

Harry L. Pelzer. Director, Sinclair Research Laboratories; formerly, manager. Joined Sinclair in 1919 at the East Chicago refinery. Subsequent jobs: chemical engineer, research department, 1921; assistant superintendent, Houston refinery, 1930; manager of the Houston butadiene plant, 1942; assistant manager, research department, 1946.

Emil Ott. Recipient of the first Honor Scroll, Pennsylvania Chapter, American Institute of Chemists. Director of research, Hercules Powder Co.

Desmond M. C. Reilly. New staff member, Midwest Research Institute. Since 1947, senior research chemist, Howard Smith Paper Mills, Ltd., Cornwall, Ont. Doctorate in chemistry, University College, Cork, Ireland.

Farrington Daniels. President-elect of the ACS. Professor of chemistry at the University of Wisconsin. On the faculty since 1920. Known for his work on atomic energy, he was director of the Metallurgical Laboratory, University of Chicago, 1945-46. New member of the society's board of directors: **Wallace R. Brode,** associate director of the National Bureau of Standards.

M. M. Biddison

H. O. C. Ingraham

M. M. Biddison. President, General Chemical Division, Allied Chemical & Dye Corp. Has been a division vice president since 1947. With the company for over 30 years. His predecessor: **H. O. C. Ingraham** who is retiring having served as president since 1941. He became vice president of General Chemical in 1926.

BLOCKSON
Sodium Phosphates

As leading primary producer of Sodium Phosphates, Blockson has made substantial plant additions in its endeavors to keep up with the increasing Sodium Phosphate demands of American Industry.

BLOCKSON CHEMICAL COMPANY
JOLIET, ILLINOIS

Blockson Plant . . . Joliet, Ill.

- Sodium Tripolyphosphate
- Tetrasodium Pyrophosphate, Anhydrous
- Sodium Polyphos (Sodium Hexametaphosphate) (Sodium Tetraphosphate)
- Trisodium Phosphate, Crystalline
- Chlorinated Trisodium Phosphate
- Trisodium Phosphate, Monohydrate
- Disodium Phosphate, Anyhdrous
- Disodium Phosphate, Crystalline
- Monosodium Phosphate, Anhydrous
- Monosodium Phosphate, Monohydrate
- Sodium Acid Pyrophosphate
- Sodium Silicofluoride
- Sodium Fluoride
- Hygrade Fertilizer

BLOCKSON

WESTON *Readable* ALL-METAL THERMOMETERS

—AVAILABLE IN THESE 3 TYPES

STANDARD INDUSTRIAL THERMOMETERS

All-metal dial types with stainless steel stems, in straight and angle forms. Scale lengths 3"—6" and 9", with stems from 2½" to 72". Available as testing thermometers, and for general purpose and heavy duty service. Ranges from −100 to +1000°F. All-metal construction prevents breakage, assures dependable accuracy for longer periods.

CONTACT MAKING THERMOMETERS

Combines the features of the all-metal indicating thermometer with an alarm or control device. Has adjustable contact arm mounted in the glass and bezel. Supplied to make contact on increasing or decreasing temperatures. Has positive magnetic type contacts. Contact rating . . . 100 ma at 110 volts a-c; 50 ma at 110 volts d-c. Stem lengths 2½" to 24".

MAX-MIN® THERMOMETERS

Equipped with a manually set red index which moves up or down scale with pointer, remaining at extreme temperature reached until reset. Thus one reading gives present temperature, and maximum or minimum reached since last reading. Available in scale lengths of 6" and 9"—stem lengths 2½" to 24".

Literature describing Weston all-metal, as well as electrical and glass thermometers, sent on request. WESTON Electrical Instrument Corporation, 583 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

NAMES IN THE NEWS, cont. . .

Henry N. Lyons. Manager of technical service, Barrett Division, Allied Chemical & Dye Corp. Formerly with Devoe & Reynolds Co.

H. N. Lyons

D. G. Rogers

D. G. Rogers. From executive vice president to president, National Aniline Division, Allied Chemical & Dye Corp. He has held his former post since 1950.

Wesley S. Walker. Director of the general industrial equipment division, NPA. On leave from his post as product manager for nitrogen, Linde Air Products, New York. With Linde for about 25 years. Chemical engineering graduate of the University of Wisconsin.

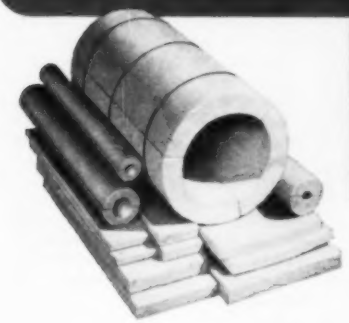
Edmond L. d'Ouville. Division director of research, Standard Oil (Indiana) research department at Whiting, Ind. Continues as senior technologist in the development and patent department, a position held since 1944. Joined Standard in 1937 as a research chemist. From 1942 to 1944, research fellow at Mellon Institute. Doctorate from the University of Pennsylvania.

B. B. S. T. Boonstra. Head of the rubber research group, Godfrey L. Cabot, Inc., Boston. Formerly chief of the technical laboratory of rubber-stitching at Delft, Holland. New head of the organic research group: **James C. MacKenzie,** formerly with Canadian Industries, Ltd. New assistant director of Cabot's development division, Pampa, Tex.: **R. E. Dobbin,** formerly head of the applied research section in Boston.

C. P. Hackett. From chief engineer to assistant director of development, Solvay Process Division, Allied Chem & Dye. From assistant chief engineer to chief engineer: **I. H. Munro.**

Bryce I. MacDonald. Manufacturing engineer, GE silicone plant in Waterford, N. Y. Since joining GE in 1946, has served progressively as process development engineer, proc-

Pattern for the Future...



MODERN CONSERVATION PROJECT—the new Snyder Gasoline Plant, Snyder, Texas, operated by Sunray Oil Corp. for some 30 companies and 60 individuals. Plant-process heating equipment and steam lines are insulated with Kaylo Heat Insulation. General contractor—The Fluor Corporation, Ltd., Los Angeles, Calif.; insulation contractor—Industrial Insulators, Inc., Houston, Texas.

Leading Refiners Are Switching to KAYLO HEAT INSULATION

The growing trend to Kaylo Heat Insulation is a logical result of the outstanding combination of advantages offered by this revolutionary heat-saving material.

Kaylo Heat Insulation, a hydrous calcium silicate, has high insulating value over a wide temperature range. It is *effective* up to 1200°F.—thus eliminating the need for combination coverings in nearly all operating conditions.

In addition, Kaylo Heat Insulation has these excellent physical characteristics: it is insoluble in water and incombustible. It has dimensional stability . . . high strength . . . light weight — properties vital to a superior heat insulation.

Its ease of handling, cutting and fitting simplifies application—saves time on the job. With these important extra advantages, *at no extra cost*, little wonder that leading refiners are switching to Kaylo Heat Insulation.

For complete details on Kaylo Heat Insulation, write Dept. N-255, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

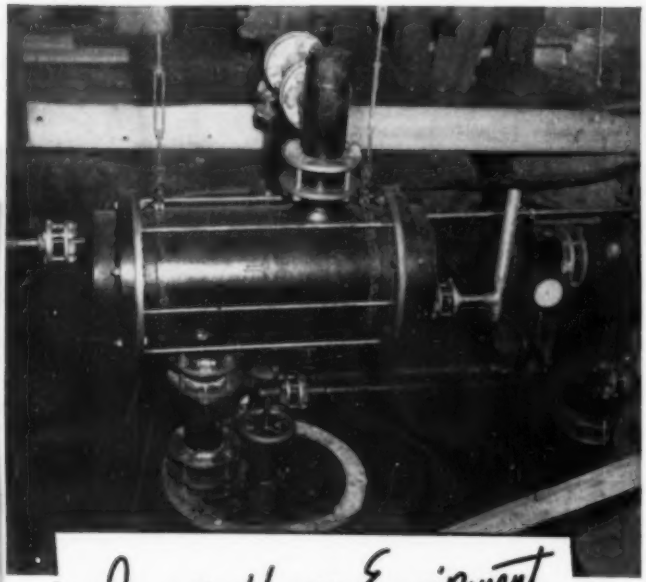
SEE OUR CATALOG IN THE REFINERY CATALOG

KAYLO® ... *first in calcium silicate*

...*pioneered by* OWENS-ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND DETROIT • HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

If your processing calls for acids, alkalies, salts or solvents...



Specify Haveg Equipment

Haveg processing equipment is exceptionally resistant to almost all acids, alkalies, salts and solvents—and this corrosion resistance is throughout its entire mass. Haveg is not a lining, coating or film, but a chemically resistant structural plastic. Scratches, gouges or chipping do not affect the corrosion resistance of the equipment.

And because it is a structural material almost any type of equipment can be made of Haveg—tanks, towers, fume duct, piping, valves, pumps, condensers, jets and many other types of equipment can be economically built of Haveg.

For more information on this unique, corrosion-resistant Haveg equipment, write for latest bulletin.

HAVEG CORPORATION
NEWARK 8, DELAWARE
FACTORY: MARSHALLTON, DEL. - TEL. WILMINGTON 3-8884

ess engineer, project engineer. Previously with Jefferson Chemical Co. as a chemical engineer.

Henry T. Ward. Head of Kansas State College's chemical engineering department which has just been accredited by the Engineers Council for Professional Development.

H. T. Ward

R. Gilmont

Roger Gilmont. Adjunct professor of chemical enginering, Polytechnic Institute of Brooklyn. Continues as technical and research director, Emil Greiner Co., a post he has held since 1947. Studied at Cooper Union.

Leo Dickison. Assistant director of research, Bristol Laboratories, Syracuse, N. Y. Formerly Bristol's director of pharmacologic research. Doctorate from Vanderbilt University.

Lloyd E. Parks. General manager, Bee Chemical Co. For the past nine years with Sharples Chemicals; his last position there was chemical products manager. Doctorate in chemistry from the University of Maryland.

Charles A. Thomas. Trustee of the Carnegie Corp. of New York. President of Monsanto Chemical Co. and a key figure in atomic energy development.

J. O. Hendricks. Associate director of the Minnesota Mining & Mfg. Co. central research laboratories. Joined 3M in 1936. Job history: head of the organic chemistry section, in charge of the colloid section, assistant director of the central research laboratories. Doctorate from the University of Illinois. New assistant directors of the laboratories: **Matthew W. Miller,** formerly head of the organic section; **H. M. Scholberg,** formerly head of the electrochemical section.

Arthur H. Nellen. Recipient of an award from the Department of the Army for his contribution to the

World War II effort in industrial intelligence. Other recipients: **Warren F. Faragher,** technical advisor to the vice president for research and development, Houdry Process Corp.; **Russell P. Heuer,** vice president of the General Refractories Co.

Roger Adams. One of the recipients of the Northwestern University Centennial Award for the Northwest Territory. Head of the chemistry department, University of Illinois. Some other recipients: **Percy L. Julian,** director of research, soya products division, Glidden Co., Chicago; **Edward C. Kendall,** chemist, Mayo Clinic, Rochester, Minn.; **Harold C. Urey,** nuclear physicist, chemist, University of Chicago.

Thomas H. Cleveland, Jr. Group leader in Monsanto Chemical Co.'s phosphate division research department. Has been a research chemist with the company since 1947. Graduate of Birmingham-Southern College.

Gordon H. Lovett. Project leader, process engineering department at the Texas City plant of Monsanto Chemical Co. Job chronology at Monsanto: joined as a research chemist at the central research laboratories at Dayton in 1947; research chemical engineer in pilot plant and chemical engineering design and evaluation activities, 1947. Purdue graduate.

Karl W. Rausch, Jr. Winner of the A. McLaren White Award presented by AIChE for his solution while and undergraduate of an engineering contest problem. Yale graduate in chemical engineering.

Louis F. Mullick. Vice president in charge of plant and production, Walker Laboratories, Mount Vernon, N. Y. Formerly, production manager. Joined the company in 1943. Studied at CCNY and Columbia.

L. F. Mullick

A. S. Foust

Alan S. Foust. Head of the department of chemical engineering, Lehigh University. Formerly, professor of chemical engineering, University

Permanently Impervious to HCL or Equivalents

IMPERVITE

HEAT EXCHANGERS — ABSORBERS

Even such a tough corrosive as Hydrochloric Acid will not break down the resistance of Impervite, made from graphite impregnated with special-formula resins developed exclusively by Falls Industries. Typical of the many types of heat exchangers made by Falls from Impervite is the 158-tube horizontal tube-and-shell unit shown above. Also: 7, 14, and 24-tube stock units or special designs up to 222 tubes. Impervite absorbers for processing gases from 40% to 100%. Hcl. Plate or immersion heaters to any capacity.

IMPERVITE TOWERS

for absorption, scrubbing, fractionation, extraction and related processing are made in five stock sizes with 12", 15", 18", 24" and 30" ID sections easily assembled to any suitable height. Sections up to 24" are monolithic cylinders machined from solid Impervite. Larger sizes are machined segments permanently cemented together. Typical 33" sections at left are top and base of special 36-foot tower.

PIPES, VALVES, FITTINGS

of Impervite, all with machine threads, are available in sizes from ½" to 10" ID. Falls also offers chemically impervious pumps, with Impervite at all exposed points.

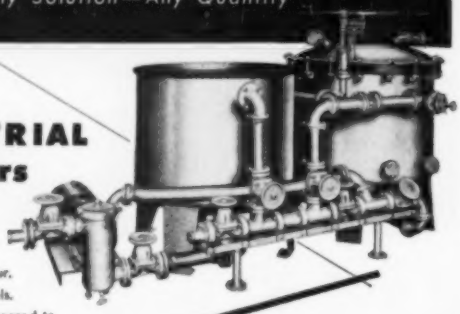
SEE PAGES 685 TO 688 CHEMICAL INDUSTRIES CATALOG, OR WRITE FOR IMPERVITE BULLETIN.

Falls Industries, Inc.

AURORA ROAD · SOLON, OHIO

Bonus Performance
IN SOLUTION CLARIFICATION
Any Solution—Any Quantity

INDUSTRIAL Filters



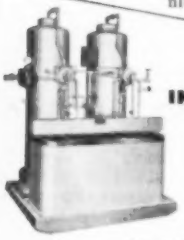
100 to 15,000 gallons per hour.
Portable and stationary models.
Special filtering systems engineered to meet unusual requirements.

and it's performance that counts . . .

The engineering, design, and construction of INDUSTRIAL filters have proved out in long service. With the outlet near the top of the chamber a uniform precoat is deposited on the filter leaves as the solution fills the chamber. The outside lockup simplifies the lockup of the leaf and bag assemblies. INDUSTRIAL exclusive air-wash cleaning method practically eliminates the usual labor, downtime, and the inconveniences of dismantling the filter after each cycle. INDUSTRIAL filters are often in operation for months without removing the cover. All these features add up to bonus performance—clear filtrate at low over-all cost per gallon.

Ask for Bulletin 100-CPI

This bulletin gives complete information on INDUSTRIAL features, the sizes and capacities of the standard models, and details on the uses of INDUSTRIAL filters for solution clarification.



INDUSTRIAL Ion-Exchange Demineralizers
For Low-Cost Chemically Pure Water

Standard INDUSTRIAL demineralizer units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

Write for Full Information and Recommendations

INDUSTRIAL FILTER & PUMP MFG. CO.
5918 Ogden Avenue
Chicago 50, Illinois

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity
RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

NAMES IN THE NEWS, *cont. . .*

of Michigan. Some previous jobs: chemist in charge of corrosion studies for the Magnolia Petroleum Co., Beaumont, Tex.; development engineer of a vapor phase cracking process, Texas Pacific Coal and Oil Co., Fort Worth, Tex. Doctorate from the University of Michigan. New head of the department of chemistry: **Earl J. Serfass,** formerly professor of chemistry at Lehigh. With Textile Foundation and National Products Co. before joining Lehigh faculty. Doctorate from Lehigh.

Ralph S. Lamie. New director, J. T. Baker Chemical Co., Philipsburg, N. J. Joined Baker last year as plant superintendent. Formerly with H. K. Ferguson as a chemical engineer on a wide variety of plant construction and operating projects.

R. S. Lamie

C. L. Thomas

Charles L. Thomas. New member of the research and development staff, Sun Oil Co. For the past six years, director of research and development, Great Lakes Carbon Corp. Previously with Universal Oil Products Co. Doctorate from Northwestern.

L. A. Roe. Director of the mining and metallurgical section of the Bjorksten Research Laboratories. Formerly technical supervisor of ore research, Jones and Laughlin Steel Corp.

Luis E. Eckelmann. Vice president of Pyrene Mfg. Co. Has been manager of the metal finishing division. Joined Pyrene in 1916 while still a student at Polytechnic Institute of Brooklyn.

Howard A. Parker, Jr. Technical director, Pan-Am Southern Corp.'s Destrehan, La., refinery. Formerly group leader, research department, Standard Oil (Indiana).

Donald L. Johnson. New member of the patent section of the Ethyl Corp. research laboratories, Detroit. Chemical engineering graduate of Purdue; law graduate of George

IDEA-PLASTICS

... from Du Pont Polychemicals Department

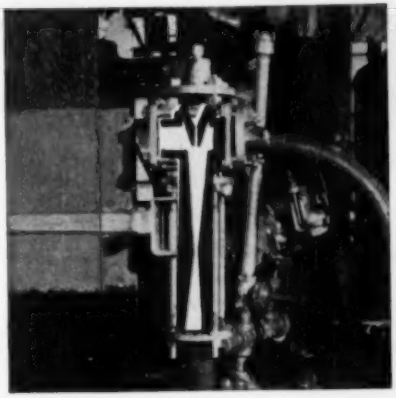
TEFLON

jet evactor lasts at least 11 times longer than conventional material

Sulfuric acid and steam shoot through this jet evactor at 360°F., 150 lbs./sq. in. But, made of DuPont "Teflon" tetrafluoroethylene resin, it's already lasted 11 times longer than evactors previously used. It's saved over $3500 in replacement parts.

"Teflon" permits a much simpler design in the evactor...eliminates the need for outside support. Wear is negligible... corrosion nonexistent. And the excellent mechanical properties of "Teflon" permit easy gasketing at discharge point — where former jets failed most frequently.

"Teflon" is widely used today in gaskets, pump and valve packings. Its unique electrical properties also make it outstanding for many kinds of insulation. And this heavy-duty plastic shows promise for a number of untried applications.



Your business may find opportunities for profitable future use in "Teflon" or in many of the other Polychemicals products. There are more than 100 of them—plastics, organic acids, amides, alcohols, ammonia, esters, resins and solvents.

Write for technical booklet on Polychemicals products for your industry

Technical bulletins on "Teflon" tetrafluoroethylene resin and the plastics and chemicals used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry.

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, 152E Nemours Building
Wilmington 98, Delaware

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

DARCO® G-60

filters three times faster than ordinary carbons!

UNDER COMPARABLE CONDITIONS, Darco G-60 has a filtration rate three to four times that of ordinary carbons! This means cost-cutting acceleration of the step which is so often a costly bottleneck in a process—filtration.

Maximum filterability is only one feature of Darco G-60, the activated carbon of *premium* purity. It also gives you the ideal combination of high adsorptive capacity and low retention loss—plus freedom from extractable contaminants.

Write for the complete story and a sample of this outstanding carbon today.

IMAGINUITY AT WORK

Here's a trick worth trying! To remove trace metals from plasticizers and other water-immiscible liquids: Shake liquid with small amount of water. Separate excess water, then treat liquid with about 1% Darco G-60. This will remove the haze of emulsified water together with the trace metal that has been transferred to the water phase.

DARCO G-60

Highest purity... by the gram or carload

DARCO

DARCO DEPARTMENT

ATLAS POWDER COMPANY

NAMES IN THE NEWS, *cont. . .*

Washington University. Formerly with the law and patent department of General Electric in Washington, D. C. Another new member of Ethyl's patent section assigned to the Baton Rouge plant: **John T. Balhoff.**

John C. L. Blagg. Assistant superintendent, Chas. Pfizer's Brooklyn, N. Y., plant. With Pfizer since 1936, most recently as department head for penicillin production in Brooklyn. New head of the penicillin department: **Chester H. Butt,** formerly Dr. Blagg's assistant.

Albert Weinstock. Associate chemist in the chemistry and chemical engineering research department, Armour Research Foundation, Illinois Institute of Technology. Formerly, chemist for the Quartermaster Subsistence Testing Laboratory. New associate engineer in the foundation's heat-power research department: **Cecil Schwartz.** Formerly, stress analyst for Barnes and Reinecke, Chicago.

J. C. Barthal. In charge of new products development, paper chemicals department, American Cyanamid Co. Formerly senior chemical engineer of the company's research laboratories in Stamford, Conn.

Harold Shalit. Now associated with the research division of Houdry Process Corp. Formerly with the research department of Standard Oil (Indiana). Graduate of Brooklyn Polytech. Another new member of the research staff: **L. Edward Godycki.**

L. Vernon Larsen. Section head, industrial and decorative laminates, GE's chemical division, Coshocton, Ohio. Has been doing developmental work on laminated plastics since 1948. Joined GE in 1941 as a development chemist in the plastics laboratory at Pittsfield, Mass.; group leader of the laminated development section, 1942. Chemical engineering graduate, University of Texas.

Klare S. Markley. Winner of the 1951 Southwest Award of ACS. Principal chemist of the Southern Regional Research Laboratory, New Orleans.

Helmuth C. Neumann. Research associate, chemical development laboratory, Sterling-Winthrop Research Institute, Rensselaer, N. Y. New research assistant in the chemical

development laboratory: **Donald F. Page.** New research assistant in the research coordination department: **G. Marie Agnew.**

Arno C. Fieldner. Winner of the Washington Society of Engineers award. Chief fuels technologist of the Bureau of Mines. With the bureau since 1910.

L. F. Kautz. Assistant general superintendent of the Newark plant of Sherwin-Williams. His successor as director of the Newark paint, varnish and lacquer laboratory: **E. S. Stout,** with Sherwin-Williams since 1936.

Robert C. Elderfield. Chairman of the ACS division of organic chemistry for 1952. Professor of chemistry at Columbia. On the faculty since 1936. Doctorate from MIT.

George T. Armstrong. New member of the staff of the National Bureau of Standards. Formerly an instructor in chemistry at Yale. Doctorate from Johns Hopkins.

Richard E. Dunning. Production superintendent, Bee Chemical Co., Chicago. Formerly with Bjorksten Research Laboratories. Graduate of the University of Wisconsin.

Richard T. Walsh. Superintendent, Coshocton, Ohio, plant, GE chemical division. Has been group leader of product engineering at Coshocton since 1949. Joined GE in 1939 as a chemist. New manufacturing engineer, Coshocton plant: **Earl F. Arnett,** formerly in charge of the chemical process development section. With the company since 1940.

Frederic W. Hammersfahr. In charge of the chemical process development laboratory's Pittsfield, Mass., group, GE chemical division. Formerly with General Tire and Rubber Co. where he has been a development engineer since 1947. Chemical engineering graduate of MIT.

J. Fred Dudley. Chief engineer, Commercial Solvents Corp. Joined the company in 1943, appointed assistant chief engineer in 1951.

G. P. Connell. With the corrosion engineering staff of the Hinchman Corp., Detroit. Formerly professor and head of the department of chemical engineering, Lawrence Institute of Technology.

Robert F. Huehner. Process engineer and director of development for all

Q: are you throwing away money on costly work clothes replacements?

for acid and CHEMICAL RESISTANT INDUSTRIAL GARMENTS that outlast cotton and wool over 13 to 1

INTO DUPONT

...der Acrylic Fiber; Fabric by

As Proven in Exhaustive Laboratory Tests, WORKLON INDUSTRIAL APPAREL WILL:

- Resist deteriorating effects of acids and chemicals, in spray, fumes or splash
- Resist mildew, sunlight, grease, climatic conditions
- Resist penetration of Ultra-violet rays
- Resist wear by abrasion
- Launder under any conditions; Non-shrinkable, unaffected by bleaches and detergents
- Retain permanent crease; dry quickly; need little or no ironing
- Also available in lint free weaves

Worklon work clothes not only offer real savings on replacements . . . they also are preferred by workers because they are well tailored and functionally designed.

Created by

WORKLON®

Worklon, Inc. Dept. C 1
253 West 28th St., New York 1, N.Y.

Gentlemen:

Please send me FREE OF CHARGE your catalog of industrial apparel made of Orlon . . . a DuPont Acrylic Fiber.

Firm Name_____

Address_____

City_____ State_____

Dept._____

NOW added versatility for the Beckman Model B Spectrophotometer . . .
A NEW REFLECTANCE ACCESSORY that simplifies color evaluation
To further increase the wide range versatility of the well-known Beckman Model B Spectrophotometer, a new Reflectance Accessory is now available for use on opaque, colored samples in solid, liquid or powder form. There are many useful applications for this accessory in the precise evaluation and comparison of color intensities and hues.
For example, diffuse reflectance measurements are useful for accurately controlling the whiteness of talc . . . for controlling artificial coloring of foodstuffs such as butter, catsup, and condensed milk . . . for calculation of dye bath recipes in textile processing . . . for grading the color of paper and the whiteness of flour . . . for matching and controlling shades of powder, rouge and lipstick, paints and inks and many other products where accurate color measurements are essential.
SEND FOR NEW BULLETIN
BECKMAN
INSTRUMENTS
SOUTH PASADENA 12, CALIF.

Easily Installed

The attachment consists of an integrating sphere in holder and a sliding sample tray which are easily installed in place of the standard Model B sample compartment and cell carriage.

Precise Measurements

To permit utmost measurement precision, a detent mechanism operated by a convenient push button in the sample tray knob exactly reproduces forward and backward position of the sliding sample tray. The resulting precision is particularly valuable for accurate measurements on samples with rough surfaces or non-homogenous colors.

Readings taken rapidly are reproducible to at least 1%—with careful technique even greater precision is obtained.

Operating Convenience

Special provision has been made so that liquid samples can be conveniently inserted without spilling . . . powdered samples without disturbing the smoothed surface.

Sample Size

Sample size is approximately 1" x 1 1/4" with a maximum thickness of 5/16"—ample for most applications. Or, by simply rotating the sphere 180° in its holder, larger samples can easily be accommodated.

Quick, Easy Readings

Accurate color measurements are made with great speed and simplicity. First the instrument is adjusted to read 100% reflectance on a white standard (such as MgO), the sample is moved into position and the percent reflectance (compared to the standard) is then read directly from the meter. It's as simple as that—and the three-compartment sample tray permits quick comparison of two samples and a standard on each run.

European operations, Corn Products Refining Co. Formerly a chemical engineer with the company's Corpus Christi plant. With the company since 1938.

William Arthur Gruse. Recipient of the Pittsburgh Award for outstanding service to chemistry of the Pittsburgh section, ACS. Administrative fellow of the petroleum refining fellowship at Mellon Institute. With Mellon since 1919.

W. A. Gruse

A. L. Taylor

A. Lloyd Taylor. Director of research, MacDermid Western, Inc., Ferndale, Mich. Formerly, research supervisor, Wyandotte Chemicals. Earlier positions: director of the department of chemistry, Pease Laboratories, New York; director of research, Oakite Products; vice president in charge of research and development, H. L. Shaw and Sons, Portsmouth, N. H.

Homer R. Duffey. From general manager, chemical department, to vice president, Quaker Oats Co., Chicago.

T. F. Cooke. Manager, application laboratories, American Cyanamid's textile resin department. Has been assistant director of the application research department since 1949. Joined Calco in 1940 as a research chemist. Doctorate from Yale.

F. W. Scheineman. From assistant chief engineer to chief engineer, manufacturing department, Standard Oil (Indiana). Joined Standard in 1926 as an engineer at its Whiting refinery. Graduate of the University of Illinois. New superintendent of the operations and cost control sections: **F. C. Smith,** formerly section supervisor. Joined standard in 1943 as a chemical engineer at Whiting. Cornell graduate.

Patrick DiCerbo. Product engineer on electric insulating materials, GE's chemical division. Has been a member of the application engineering

Century

Serves the Electric Motor User in Two Important Ways:

1. Century motors are designed and constructed for a long, dependable operating life.

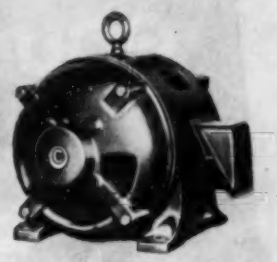
2. Just as important—they are skillfully selected to match the operating characteristics of the many kinds of equipment they drive.

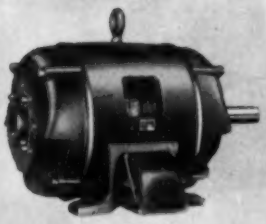
IN CENTURY'S wide range of types and sizes (up to 400 H.P.) there are available: 4 standard classes of starting torque characteristics—6 methods of speed control—constant and short time ratings—4 basic classes of frame protection against atmospheric hazards—a dozen methods of mounting the motor to the equipment—plus many special specifications to meet the requirements of the BIG NAME equipment manufacturers who use Century motors as a component part of their equipment.

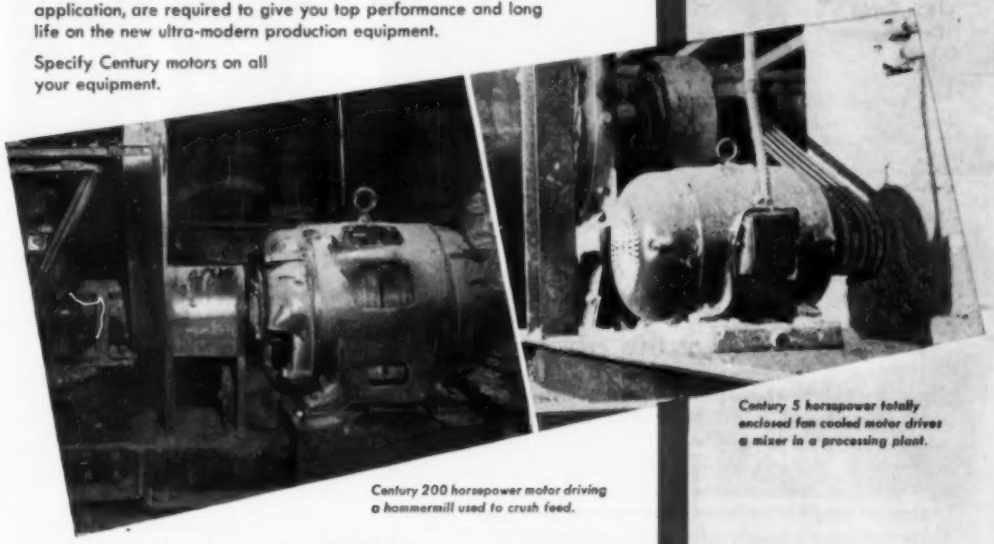
Teamwork with equipment producers gives you skillfully selected motors from Century's wide range of types and sizes . . . properly applied to match the performance characteristics of the machines they drive.

Both a properly designed and constructed motor, plus skillful application, are required to give you top performance and long life on the new ultra-modern production equipment.

Specify Century motors on all your equipment.







Century 5 horsepower totally enclosed fan cooled motor drives a mixer in a processing plant.

Century 200 horsepower motor driving a hammermill used to crush feed.

Century SERVICE Is Near Any CENTURY Motor Driven Equipment

Prompt Service is offered by CENTURY'S National Network of more than 200 Authorized Service Stations, supervised by 28 Century Sales offices.

1. Facilities for immediate exchange of most CENTURY standard ratings of standard construction are available at CENTURY Authorized Service Stations.
2. CENTURY Authorized Service Stations are qualified and equipped to service and repair any piece of CENTURY apparatus.
3. Genuine CENTURY renewal parts are available at CENTURY Service Stations, CENTURY Parts Distributors and at the factory in St. Louis.

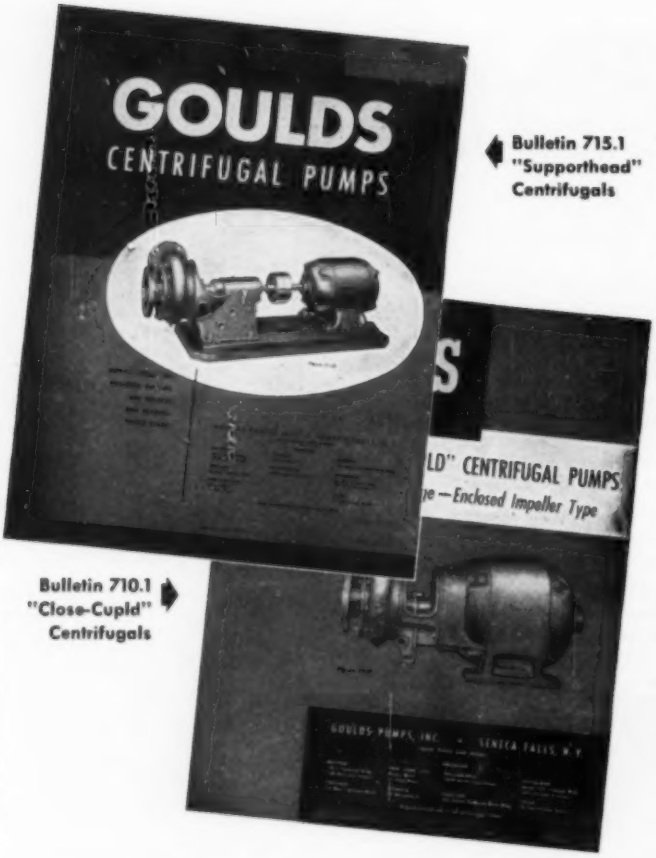
709

CENTURY ELECTRIC CO.

1806 Pine St. • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Century C MOTORS



These new bulletins make it easier for you to select the right pump

These new bulletins have been designed to help you. New sizes are listed, and, in each bulletin we have put a composite rating chart which includes both "Close-Cupld" and the supporthead. This makes it dead simple to put your finger on the right pump for your requirements.

Another valuable feature of these bulletins is the parts chart. Using this you see exactly what parts are interchangeable for all size pumps and so can keep your spare parts investment to a minimum.

Use the coupon below to send for these useful FREE bulletins *today*. Goulds Pumps, Inc., Seneca Falls, N. Y.

PUMPS INC.
Goulds Seneca Falls New York

GOULDS PUMPS, INC.
Dept. CE , Seneca Falls, N. Y.
Send Bulletin 710.1 ☐
Bulletin 715.1 ☐
Name_____
Company_____
Address_____
City_____ Zone____ State____

section since 1948. With the company since 1928.

Norman T. Robey. An assistant general superintendent of the Casper, Wyo., refinery, Standard Oil (Indiana). Has been assistant superintendent of the heavy oils division at the company's Wood River, Ill., refinery. Joined Standard in 1936 as a chemical engineer in the Whiting, Ind., research laboratory.

Jerome T. Coe. Customer service supervisor for silicone products with offices in Waterford, N. Y. Has been manufacturing engineer at the silicone plant there. Previously in charge of the plant's process development section. With the company since 1942. Chemical engineering graduate of MIT.

Charles R. Wilke. This year's winner of AIChE's Junior Award. Associate professor of chemical engineering, University of California.

C. R. Wilke

R. H. Wilhelm

Richard H. Wilhelm. Winner of AIChE's William H. Walker Award. Professor of chemical engineering, Princeton. On the faculty since 1934. Doctorate in chemical engineering from Columbia.

Charles B. Roen. Development chemical engineer, Monsanto's general development in St. Louis. Has been a project engineer in the general engineering department. Previously with Shell Chemical, 1941 to 1946.

L. A. Fluck. Assistant to the manager of American Cyanamid's textile resin department. Has been manager of the application laboratories of the textile resin department since 1948; before that, development chemist in the company's textile chemicals department in Stamford, Conn. Chemistry graduate of Brown University.

Ernest H. Volwiler. Honorary member, American Institute of Chemists. President and general manager, Abbott Laboratories. Started

with Abbott in 1918 as a research chemist. Since then: chief chemist, director of research and a member of the board of directors, vice president in charge of research and development, executive vice president.

Nat Kessler. Technical supervisor at the Painesville, Ohio, soybean processing plant of the A. E. Staley Mfg. Co. Chemical engineer with the Staley company at Decatur since 1944. Graduate of Washington University, St. Louis, Mo.

John J. Russell. Director of special research with particular emphasis in the field of silicone chemistry, Midland Industrial Finishes Co., Waukegan, Ill. Previously vice president in charge of production for National Glaco Chemical Corp.

Arthur W. Mohr. President of the National Agricultural Chemicals Assn. President of California Spray-Chemical Corp., Richmond, Calif. Vice president: **Paul Mayfield,** assistant general manager of Hercules Powder Co.

OBITUARIES

William L. Judefind, 55, assistant to the vice president of operations, Davison Chemical Corp., died November 14. He came to Davison in 1920 as a research chemist right after taking his PhD from Johns Hopkins.

Theodore P. Walker, former president and chairman of the board of Commercial Solvents Corp., died in New York November 28. He joined the company in 1922, retired as chairman in 1950.

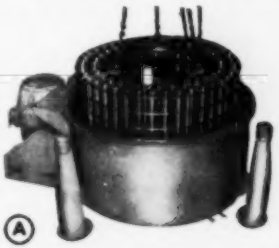
S. Peiser, 80, president of Consolidated Chemical Industries, Inc., died in San Francisco December 3.

James G. Vail, 65, retired vice president of the Philadelphia Quartz Co., died in New Delhi, India, December 11. He joined the company in 1905 as a chemist, became chemical director in 1931, vice president in 1940. In 1933 he won the Chemical Industry Medal awarded by the Society of Chemical Industry.

James A. Rafferty, 65, vice president and director of Union Carbide & Carbon Corp. and an important contributor to the government's wartime synthetic rubber and atomic energy programs, died in Fort Lauderdale, Fla., December 20.

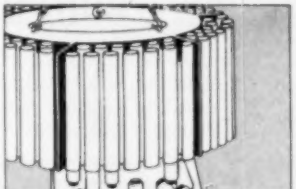
IT'S HERE!

New Bottom Unloading Carrier Cuts Centrifuging Time, Labor and Costs

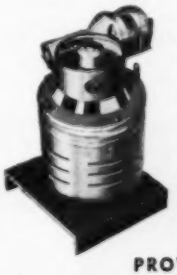


Originally designed for the impregnation of insulating materials, this special AT&M carrier — featuring exceptionally fast, easy unloading — offers new advantages to many processes.

It is incorporated in a link-suspended type AT&M centrifugal, in which a specially designed link guarantees minimum vibration in the foundation, uniform load distribution on the links and smooth operation with "out-of-balance" loads. Optional features include: fume-tight covers for volatile liquids, spray pipes, exhauster connections or removable baskets. Drives are direct-connected or clutch-operated. Speed lock prevents opening of cover until machine is at full stop.



(A) The new AT&M carrier, illustrated, is loaded conventionally, through the top. (B) Unloading is effected through a six-segment trap door in the bottom, eliminating all handling or tipping, reducing the time and trouble of unloading to a minimum, and enabling more cycles per shift.



Another AT&M Advanced Feature

Designed to provide a perfectly controlled, fixed speed essential to the unloading of sticky sludge and many other materials, AT&M's two-motor, free-wheeling drive combines positive operation with maximum safety. Built-in oiling system requires no pumps, or check valves.

You, too, can benefit with AT&M equipment. Does away, in many instances, with settling tanks, filter presses, squeeze rolls, vacuum presses. Used in processes involving chemical preparations — explosives — nitrating — acid wringing — ammonium sulphate — oils and greases — paints, varnishes — ceramics, bricks, clay — fertilizers — nitrates — sludges — textiles — carbonizing (textiles) — plastic bases.

PROVE TO YOURSELF

how centrifuging can benefit you. Send us a sample of your material for centrifuging to your specifications, or rent an AT&M laboratory centrifugal for your own tests at a nominal fee. And send for free booklet today.

FREE Illustrated Booklet

AMERICAN TOOL AND MACHINE COMPANY
1415 Hyde Park Avenue, Boston 36, Mass.

Please send me my free copy of the new AT&M booklet "Centrifugal Force." I am interested in the following processes:

Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐ Filtration ☐ Draining ☐ Thickening ☐ Impregnation ☐ Sedimentation ☐

ANY OTHER PROCESS.....

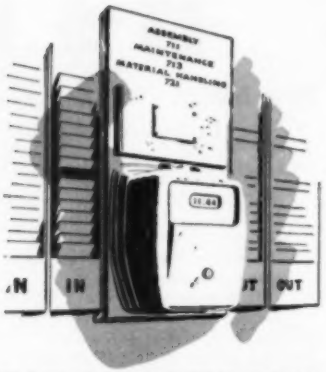
Name..... Title.....

Company.....

Street.....

City..... Zone..... State.....

SAVE TIME, SPACE AND COSTS WITH A.T. *and* M. CENTRIFUGING



A BOILER THAT PUNCHES THE TIME CLOCK

Yes — a Cleaver-Brooks Boiler "Punches In" to meet a heavy steam demand — "Punches Out" during low load periods.

Steam costs can eat deeply into profits when steam loads fluctuate — or are intermittent. With a Cleaver-Brooks boiler you are equipped for heavy or light . . . steady or variable loads, operating at full 80 per cent efficiency over the entire working range of the boiler.

You are assured of fuel economy through high heat transfer. *All* Cleaver-Brooks boilers are of the four pass design and the maximum useable heat is absorbed in these four passes before the combustion gases leave the boiler.

Remember the name Cleaver-Brooks if you are considering a change in your present boiler plant. Think about flexibility and get the complete facts about Cleaver-Brooks Self-Contained Boilers — standard models in 15 to 500 HP, 15 to 250 psi, oil, gas, combination oil and gas fired — 80 per cent efficiency.

CLEAVER-BROOKS COMPANY
352-A E. KEEFE AVE., MILWAUKEE 12, WIS.
Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment Oil and Gas-Fired Conversion Burners

Cleaver-Brooks
STEAM BOILERS
the first and finest of their class

Write for the latest graphically illustrated Cleaver-Brooks Boiler Catalog. It tells and shows how you can save money with a Cleaver-Brooks Boiler installation.

INDUSTRIAL NOTES

NEW FACILITIES

Pennsylvania Salt Mfg. Co.—An electrolytic chlorine-caustic soda unit at its Calvert City, Ky., works. It will be completed early in 1953 at a cost of $8 million. The new unit will use the DeNora electrolytic mercury cell rather than the modified Gibbs diaphragm cell used in other chlorine-caustic operations of the company.

General Petroleum Corp., Los Angeles—A giant distillation tower, 10 ft. in diameter and 157 ft. high, to increase production of aviation fuel components. The project which will cost over $500,000 is scheduled for completion by mid-1952.

Hercules Powder Co., Wilmington, Del.—A $2.5 million plant in Henderson, Nev., for the manufacture of toxaphene, chemical base for agricultural insecticide. It will increase present output by 25 percent when completed early in 1953. The site is adjacent to Stauffer Chemical's plant which will supply the required chlorine.

Hercules Powder Co.—A unit in Savannah, Ga., for the production of wet-strength resins for paper.

Carbide and Carbon Chemicals Co.—Expanded facilities in South Charleston, W. Va., for production of tri(2-ethylhexyl) phosphate, known as Flexol plasticizer TOF. Production from the new unit which doubles present capacity will be used 100 percent for national defense purposes.

Davison Chemical Corp., Baltimore—Its eighth fertilizer plant through the acquisition of the Michigan Fertilizer Co. of Sandusky, Ohio. It has an annual capacity of 65,000 tons of mixed fertilizer.

Activated Fertilizer Corp.—A $100,000 plant at Spokane, Wash., to manufacture superphosphate soil fertilizer. It's the first plant of its type in the area.

Pittsburgh Plate Glass Co.—A new plant in Springdale, Pa., for the manufacture of Selectron, a polyester resin plastic. The new unit will double the company's production capacity.

Wm. S. Merrell Co.—A new organic research laboratory in Cincinnati. Designed to protect lives and prevent damage to valuable equipment, it boasts blow-out type walls and numerous explosion-proof devices.

Stauffer Chemical Co.—A laboratory adjacent to its Chauncey, N. Y., plant where additional facilities for pilot plant work are maintained.

Archer-Daniels-Midland Co.—A sales office in Cincinnati managed by Daniel J. Marien, Jr.

Alaska Chemical Co., Fairbanks—An oxygen and acetylene plant in Anchorage.

Dow Chemical Co.—A Los Angeles Harbor Terminal for storage of 50 percent concentrate caustic soda solution. This enables the company to supply the Southern California-Arizona market by tank truck rather than by railroad tank car from its Pittsburg, Calif. plant.

Wyandotte Chemicals Corp.—An industrial insecticides sales department to handle sales of benzene hexachloride and related products. C. F. Gerlach, formerly vice president and general sales manager of Michigan Chemical Corp., will head the new department.

Republic Flow Meters Co., Chicago—A factory branch office in Houston to serve the Texas Gulf Coast.

Atlas Chain & Mfg. Co., Philadelphia—A New York office headed by Oliver J. R. Troup, Jr.

NEW LINES

Schwartz Chemical Co., New York—Two bonding agents for Lucite, Plexiglas and other acrylics. Called H-94 and H-114, they are free-flowing, water-white solvent cements.

Food Machinery & Chemical Corp.—Machines that produce bags from transparent film, and form, fill and seal such bags; equipment for weighing and filling free-flowing dry products, for mechanically wrapping products and for heat-sealing packages. These products were previously manufactured by Simplex Packaging Machinery, Inc., Oakland, Calif., which Food Machinery has recently acquired.

NEW LOCATIONS

Technical Associates, Inc., manufacturer of instruments for nuclear research, has moved to 140 West Providencia Ave., Burbank, Calif.

E. I. du Pont de Nemours & Co. has moved the Gulf Coast office of its petroleum chemicals division to the Bank of Commerce Bldg., Houston.

Bigelow-Liptak Corp. has moved its general offices to 2550 West Grand Blvd., Detroit. The company's designs are used to enclose boilers, for refinery heaters, coal, pulp and food dryers.

United States Rubber Export Co., Ltd., has moved to the new Chrysler Bldg. East in New York.

NEW NAMES

Chicago Metal Hose Corp. has changed its name to Flexonics Corp. The company's sixth manufacturing plant has almost been completed in Memphis, Tenn.

American Tung Oil Mills, Inc., Brooker, Fla., has changed its name to Southern Oil & Chemical Co.

NEW REPRESENTATIVES

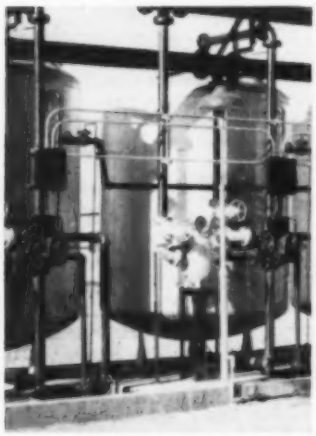
Fenwal Inc. of Ashland, Mass., manufacturer of thermostats for precision temperature control and detection, has appointed Joseph P. Maguire of New Orleans as its representative for the Louisiana area.

Bolta Products, Inc., Lawrence, Mass., has appointed H. N. Hartwell & Son, Boston, its distributor for its rigid vinyl plastic tubing, pipes, rods, sheets, blocks, and molding compounds.

NEW COMPANIES

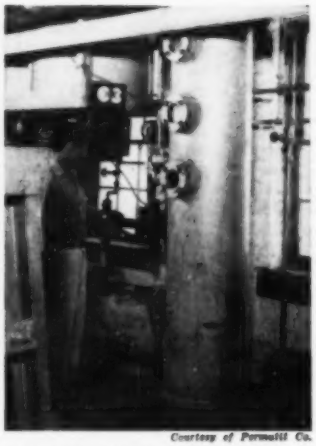
American Metallic Chemicals Corp., Portland, Ore., to manufacture various metallic chemicals used as intermediate materials in the chemical industry.

Beemak Plastics, Los Angeles, to make thermoplastics. The company will specialize in custom work.



EXCHANGE: Water softening.

REMOVAL: Polyhydric alcohol.



Courtesy of Permutit Co.

CONCENTRATION: Scopolamine.

Five Ways to Use Ion Exchange

- **Exchange of ionic constituents**
- **Removal of ionic constituents**
- **Fractionation of mixtures**
- **Concentration of ionic substances**
- **Catalysis and adsorption**

General and widespread use of ion exchangers has been recognized only in relatively recent years. This is due in large measure to synthetic production of several new types of resinous plastics containing acidic or basic groups.

Ion exchange, now a common unit operation, is a diverse process—useful in a variety of industrial and research applications ranging from water softening and antibiotic purification or isolation to precise analytic methods for separation of alkaloids, purines or amino acids.

Interest in the field may be expected to continue and grow. New applications are coming up. Several publications have already appeared describing application to preparation of larger ionic materials, such as proteins and viruses. Extensive studies have been made on their use in place of soils as sources of plant nutrients.

Different physical forms of exchange resins have been developed. These include liquid exchangers, ion exchange membranes or sheets and ion exchange fabrics. Another development foretelling future applications is the use of polymeric substances which exchange electrons instead of ions.

Exchange: Today the largest single use of ion exchangers, namely, the softening of water, is an example of exchange of ionic constituents. For this purpose, any one of several mineral or synthetic cation exchangers is used in the form of the sodium salt. Calcium, magnesium and iron, which are the usual causes of hardness, have higher exchange affinities than sodium and are consequently held by the exchanger.

Difficulties are experienced when it becomes necessary to remove from a solution ions of low exchange affinity. The capacity of an exchanger to replace a monovalent ion in solution by a multivalent ion is quite limited.

However, a transformation of this type may be accomplished effectively by removing the monovalent ion through replacement with a hydrogen ion, followed by treatment with a multivalent metal hydroxide.

Removal: Ionic substances may be removed from solution by use of cation exchangers in the hydrogen form and anion exchangers in the hydroxyl form. When both cations and anions are to be removed, the two types of exchangers are used together, either alternately in series or in mixed bed operations.

In instances in which acidic and basic conditions are not permissible, the mixed-bed procedure offers definite advantages. One of the most striking examples of this application is the preparation of deionized water. Water treated by the mixed-bed process may be chemically equivalent to that obtained by triple distillation.

Although a comparison between deionization does not generally remove nonionic materials. In this respect it yields significantly different results than are obtained by distillation. The lack of effect on nonionic materials often makes possible purification of such substances.

Fractionation of ionic substances in aqueous solution represents a major research application of exchangers. Such separations may generally be accomplished if the ionic species differ in any of the following properties: ionic radius, valence, and acidic or basic strength.

Two general ion exchange methods are available for separating ionic materials of like charge. These involve either adsorption of a single component from a mixture or adsorption of all components followed by selective

"Buffalo" *Tips on Making Your Fans Last*

Specify RUBBER LINING For Your Corrosive Fume Fans—It Will Multiply Their Life

"Buffalo" RUBBER-LINED EXHAUSTERS

For any fan installation that is to handle corrosive fumes, take adequate precautions ahead of time — specify rubber lining. You will save money, fan repair troubles and valuable steel. Ordinary steel fan housings and rotors are quickly destroyed by certain fumes, but rubber coating increases fan life three to twelve times. "Buffalo" Rubber-Lined Fans have rubber "welded" to all interior parts by the "Vulcalok" process. No metal parts are left exposed.

Naturally, efficiency, smooth rotor balance and proper performance characteristics also enter into the choice of a good fume fan. We welcome your inquiries into the entire "Buffalo" line of fans which have been proving themselves in the chemical industries for many years.

Above, showing how rubber lining protects all steel parts of the fan from fume corrosion.

WRITE FOR THIS HELPFUL INFORMATION ON FUME HANDLING!

Bulletin 2424-E contains construction and performance information on "Buffalo" Rubber-Lined Exhausters and their application. Yours for the writing!

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

501 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

desorption of one component at a time. A mixture of weak and strong acids or bases may be separated by either method, but mixtures of substances of similar acidity or basicity generally required selective removal from the exchanger.

The separation of amino acids offers examples of both methods of separation. Thus, a mixture of glutamic acid and leucine may be treated with a weakly basic anion exchanger that will neutralize and adsorb only the stronger acid, glutamic acid.

A similar separation may be achieved with a strong base resin. In this case, both amino acids are adsorbed. As additional amino acid solution is passed through the column, the resin will become saturated with the two compounds. Glutamic acid, which has the higher exchange affinity, will continue to be bound. This binding will bring about the concomitant release of leucine.

Thus, pure leucine will appear in the eluate until the column is saturated with glutamic acid. Finally, the glutamic acid may be recovered by treating the column with a suitable acid agent.

Another method for separating the two adsorbed amino acids involves separation during the elution process in a manner similar to chromatography. Use is made of a third ion with a high exchange affinity which causes the displacement of the other ions.

Development with such an ion causes a series of adsorptions and desorptions of the leucine and glutamic acid. As glutamic acid causes displacement of leucine, the leucine will appear in a band below the glutamic acid and will appear in the effluent first. This general procedure has been successfully applied to amino acids of similar charge.

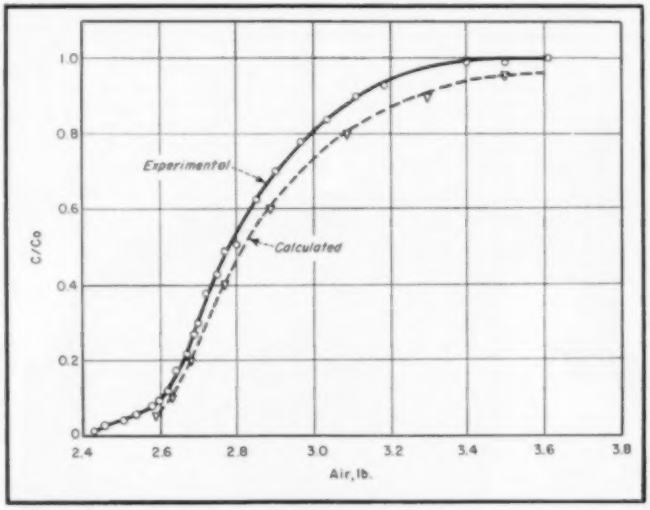
Procedures such as these have been applied to separation of numerous other ionic materials. The following have been selected as representative examples; purines, pyrimidines, nucleosides, nucleotides, rare earths, and isotopes of lithium, potassium, and nitrogen (when present in the ammonium ion).

Concentration: Another of the applications of ion exchangers, the concentration of ionic constituents, is based on similar procedures. Under favorable conditions, small amounts of ionic constituents are collected from dilute solutions and recovered in concentrated form.

This application may be useful in determining the concentrated electrolyte or in recovering ionic materials from dilute solutions. Among substances concentrated in this way are cinchona alkaloids, atropine, morphine, scopolamine, thiamin, riboflavin, folic acid, ascorbic acid, amino acids and inorganic ions.

Catalysis and Adsorption: Finally, a few applications appear to differ in nature from those involving ionic exchange. For example, the use of resins as catalysts and the adsorption of acidic and basic gases (SO_2, NH_3) by the hydroxyl and hydrogen forms of the exchangers. Quite possibly, even the adsorption could be considered as true ion exchange, for these gases must dissolve in an aqueous phase before adsorption and are then held as anions and cations respectively.

From *Research Today*, Issue No. 3, 1951. This is a copyright article and permission to use it has been given by Eli Lilly and Co.



GOOD AGREEMENT here is typical of more than 80 percent of the studied runs.

Drying Air in a Fixed Bed: Can Calculations Be Made?

NOTE: *Results of experimental work and study conducted by D. C. Eagleton and Harding Bliss of Yale University show agreement between experimental and calculated values. For the magnitudes indicated in the text, these calculated values are "sufficiently good for most design requirements." Here the two men tell how they arrived at their mathematical solution of expressing the rate equation for diffusion in terms of a solid film concept. Drying air in a fixed bed is important, not only in itself, but important as an example of the more general unit operation of mass transfer. The principles, therefore, may be important to you as background or practical material.*—EDITOR

STUDY of the literature reveals that we have very few breakthrough data on gas-solid adsorption systems. And no one has reported a completely satisfactory method of interpreting data.

Objective of our research was to secure laboratory data of effluent concentration versus time and to interpret these data in terms of fundamental concepts of diffusional or kinetic processes.

In order to simplify the problem the following conditions were imposed: (1) constant inlet composition, (2) constant inlet flow rate, (3) initially no water adsorbed on the solid, and (4) isothermal conditions (or as nearly so as possible) in bed.

Proper interpretation of breakthrough data would consist of (1) determining the proper rate equation and (2) obtaining the rate constants. Rate constants determined from lab-

THIS QUARTER-INCH KEEPS EVERY BIG INCH *alive!*

EVER see them lay a gas or oil pipeline like *this?* We mean the "big inchers" you could crawl through. They're so vital that industry is laying millions of dollars worth of new ones every year.

Unprotected, these underground steel arteries would soon rust away. But industry has developed a life-saving sheath for them and often, the main protective material is Pitt Chem Tar Base Pipeline Enamel—an impervious product of coal.

As a *basic* and *integrated* producer of coal chemicals and related products, we closely control *quality* from coal to finished coatings. That's why Pitt Chem Enamels perform better in application and service.

Whether you're considering protective coatings, or the products of any of our other integrated divisions, you'll find that it pays to buy from a basic producer.

★ Standard Grade Tar Base Enamel
★ Modified Grade Tar Base Enamel
★ Plasticized Grade Tar Base Enamel
★ Cold Applied Tar Base Coatings
★ Synthetic Base Coatings

WBO 3960

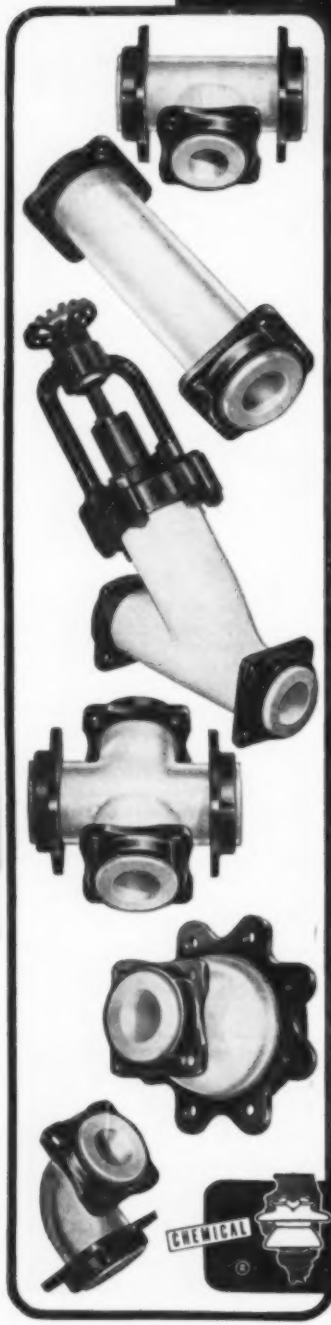
PROTECTIVE COATINGS DIVISION

PITTSBURGH COKE & CHEMICAL CO.

Grant Building · Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Install ILLINOIS PORCELAIN PIPE, VALVES AND FITTINGS



for PERMANENT Liquids Handling Systems!

Reduce costly shutdowns with the acid and alkali resistant porcelain that keeps liquids handling systems in constant operation. An Illinois porcelain system will keep production high—will eliminate losses due to corrosion, electrolysis and mineral deposits which affect ordinary fluids handling materials.

All Illinois pipe, valves and fittings are produced under the highest standards of quality control. Dimensions are accurate, ends are ground true and smooth for gasket mounting, and flanges are jig-assembled. All necessary nuts and bolts are furnished.

Illinois porcelain has inherent corrosion-proof qualities. Its super-smooth, non-absorbent inside surfaces and strong fracture-resistant walls make it outstandingly successful as a chemicals handling medium. No rough or pitted inner walls.

We would be glad of the opportunity to help you solve your corrosion problems.

CHEMICAL

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

WRITE FOR FREE CATALOG C-3

QED, cont. . .

oratory experiments could then be used to predict the time of breakthrough for a specific plant-sized adsorbent bed.

Interpretation of fixed bed adsorption data is currently hampered by the following difficulties: (1) there is no way of deciding which of the rate equations should be used, (2) even if the isotherm and proper rate equation were known, the mathematical solution is not available.

The isotherm of a gas-solid system is very important not only because it shows the capacity of the solid for a given adsorbate concentration but also because the shape of the isotherm influences greatly the operation of a fixed bed adsorption process.

It was clear from inspection of data that all the isotherms for this study are similar in shape and all are strongly self-sharpening at low water vapor concentrations.

Mathematics can be greatly simplified if it can be assumed that the band width remains constant as the adsorption zone moves down the bed. By comparing the breakthrough curves for various sets of runs in which bed length and inlet concentration were varied, the band width is approximately constant.

Examination of all runs has led to the conclusion that alumina at 80, 95 and 110 deg. F., and florite and silica gel at 80 deg. F. exhibit self-sharpening properties and constant band width behavior at low concentrations.

The interpretation method used, therefore, depends on the constant band width condition, which is a considerable simplification. However, we are still confronted with several possible rate mechanisms: gas diffusion, solid diffusion, surface reaction, or combinations of these.

Simplest of these is gas diffusion, and it was tried first. It was discovered that the Freundlich equation simply does not fit the data. And it was impossible to correlate the data by means of the Schumann-Furnas curves. So it was shown that the gas film concept alone is unsatisfactory.

It has not been demonstrated whether the additional resistance is in the nature of a slow chemical reaction or of diffusion through the pores of the solid. The argument in favor of solid diffusion over chemical reaction is as follows: (1) no single chemical reaction equation gives isotherms of the shapes obtained in this work; (2) none of the fixed bed solutions based on chemical reaction rate equations give breakthrough curves anything like those obtained in this work; and (3) the effect of tempera-

ture on the shape of the breakthrough curve is less pronounced than would be expected if a chemical reaction rate were important.

No rate equation for diffusion into solids in gas adsorption has been well established, although two have been suggested. One is familiar Fick's second law equation. The other represents the solid film concept: $dq/dt = k_s S\,(q_s - q)$.

Interpretation of the breakthrough data obtained in this research must be made in light of this study and also, for practical reasons, in light of the mathematical solutions available.

Assumptions: In view of these observations and of the great mathematical difficulties involved, it is clear that any interpretation of data will be only semi-theoretical in nature. Such interpretation is also made difficult because the rate phenomenon is more complicated than mere gas diffusion alone. Accordingly, the method finally devised is as follows:

- The adsorption zone is assumed constant in width as it moves through the bed.
- The isotherm is assumed linear but (as an approximation) not through origin.
- Both the usual gas film equation simplified solid film equations apply.
- The usual assumptions are:
  - No concentration, pressure or temperature gradients across the bed (perpendicular to direction of flow).
  - No inter-particle diffusion.
  - No diffusion in air stream in direction of flow.

Results: The expression for the dependence of $k_s S'$ on velocity for alumina and Florite is $9.3G^{0.88}$ and for silica gel is $6.3G^{0.88}$. The average value of $k_s S'$ is 7.3 determined by averaging the logarithm of this constant.

Study of the various sets of runs in which only one variable was changed shows the following effect of the variables on $k_s S'$ and $k_s S'$: $k_s S'$ is independent of bed length and temperature and varied with flow rate. $k_s S'$ for silica gel differs from that for activated alumina and Florite. $k_s S$ shows a slight dependence on inlet concentration.

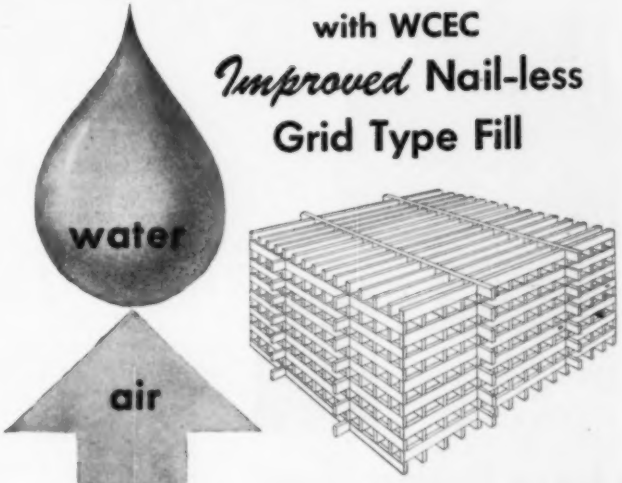
While the values of $k_s S'$ scatter considerably, no significant trend was observed with changes in flow rate, bed length, temperature, inlet concentration and temperature. They can be considered independent of these variables. Due to the method of calculation for $k_s S'$, experimental errors are greatly magnified, which is the probable explanation for such wide scattering.

TYPICAL CALCULATION

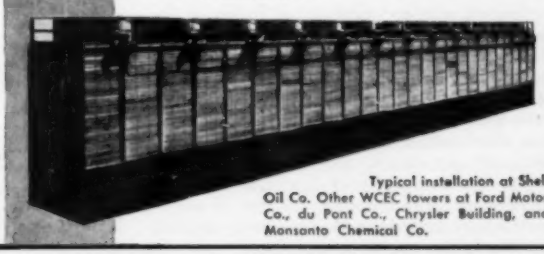
Air from a brine cooled heat exchanger saturated with water at 30

most wetted surface . . .

with WCEC *Improved* Nail-less Grid Type Fill



WCEC new improved grid type fill provides more wetted surface and greater retardation of descending water than any other design. The water is repeatedly interrupted and refilmed in its downward passage. The rising air is guided through open lanes in intimate contraflow with the water. This maximum wetted surface and maximum retardation of the water completely utilizes the heat removing capacity of the air with minimum possible air resistance, resulting in highest cooling efficiency. Consider this important feature when you consider the purchase of a cooling tower.



Typical installation at Shell Oil Co. Other WCEC towers at Ford Motor Co., du Pont Co., Chrysler Building, and Monsanto Chemical Co.

SEE OUR CATALOG IN SWEET'S FILE

TOWERS OF STRENGTH WCEC

WATER COOLING EQUIPMENT COMPANY

MAIN OFFICE • New Hampshire Ave. and Weber Road • St. Louis 23, Mo.

Fabricating Plants: St. Louis, Mo • Arcata, Calif. • Houston, Texas

REPRESENTATIVES IN TWENTY-EIGHT PRINCIPAL CITIES

BASKET TYPE

STRAINERS

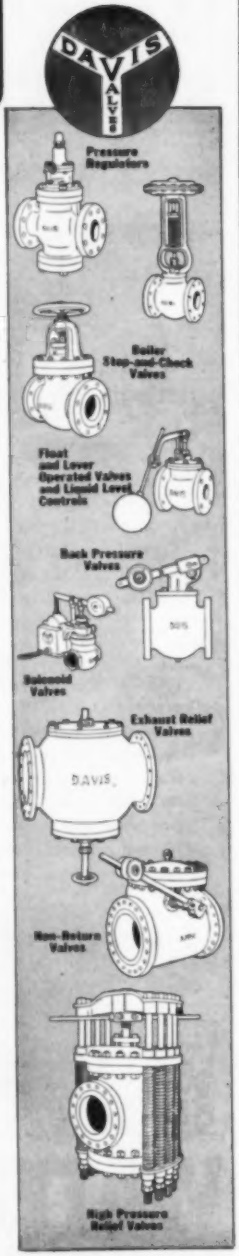
Sizes:
½" to 14"

DAVIS
No. 76
STRAINER

- *Large Strainer Area!*
- *Low Pressure Drop!*
- *Easily Cleaned!*

DAVIS Basket Type Strainers are used extensively on pressure and suction pipe lines carrying water, oil and other fluids for the protection of meters, pumps and other equipment. The No. 76 Strainer has a cylindrical basket with perforated sides and bottom. A flange at the top of the basket supports it in the Strainer. The flow enters the basket through the top. When the cover is removed the basket may be lifted out easily for cleaning. Body passages and screen have areas in excess of pipe of corresponding size, which reduces the pressure drop across the strainer to a minimum. Free screen area is from 2½ to 4½ times pipe area depending on size of perforations. The recommended size of screen perforations depends on the fluid being strained and the foreign matter in suspension.

Take advantage of
Davis' 76 Years of Experience!
Ask for recommendations.



DAVIS REGULATOR CO.

Representatives in All Principal Cities

2570 WASHTENAW AVENUE, CHICAGO 8, ILLINOIS

QED, cont. . .

deg. F. and 1 atm. is to be dried to a dew point of −25 deg. C. or less. Determine the time at which this maximum dew point will be reached for a drier 1 ft. in diameter and 4 ft. high filled with 8-14 mesh activated alumina. The air flow rate is 150 lb. air per hr. Assume an isothermal temperature of 95 deg. F. and complete regeneration of solid in each cycle.

$G = 150/\pi r^2 = (150)(4)/\pi(1)^2 = 190.8$ lb. per hr. sq. ft.
$k_eS' = 9.3G^{0.55} = 167.5$
$k_aS' = 7.3$

The average S for 8-14 mesh alumina should be about the same as the S for size III alumina used in this work. Therefore $k_eS' = k_eS$ and $k_aS' = k_aS$.

30 deg. F. dew point = 4.20 mm. Hg water partial pressure

4.20 mm. Hg H_2O = 0.00345 lb. H_2O/lb. air at 1 atm. total pressure −25 deg. F. = 0.328 mm. Hg water partial pressure.

From our data the best value for a is 0.0480 lb. H_2O per lb. solid and for a is 0.022 lb. H_2O per lb. solid.

$c_D/c_e = a/a - r'_e$
$r = -k_eS/k_aS = -167.5/7.3 = -23.6$
$c_D/c_e = 0.022/0.0480 + (23.6)(0.00345) = 0.178$

Since $c/c_e = 0.328/4.20 = 0.078$, which is less than c_D/c_e, the following equation should be used.

From our data: the bed density is 51.2 lb. per cu. ft.

Bed Weight = $(4)(\pi)(1)^2(51.2)/4$ = 161 lb.

$$\ln\frac{c_D/c_e}{c/c_e} = -\frac{c_e k_e S y}{aV} + \frac{k_e S}{V}x + 2 - \frac{c_e}{c_D}$$

$$\ln\frac{0.178}{0.078} = -\frac{(0.00345)(167.5)y}{(0.0480)(150)} + \frac{(167.5)(161)}{150} + 2.0 - \frac{1}{0.178}$$

$0.83 = -0.0804y + 179.8 + 2.0 - 5.6$
$y = 2184$ lb. air
$t = 2184/150 = 14.6$ hours

LIGNIN

. . . *Ripe for Research*

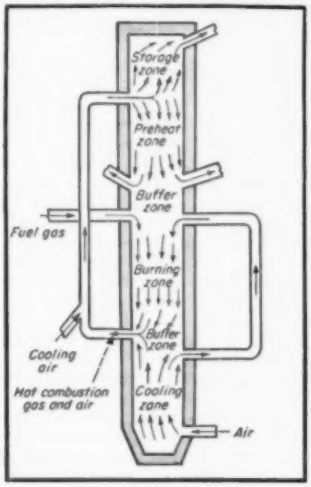
J. J. Keilen and P. R. Wiley

Most of the uses for alkali lignin deal with the lignin as derived from the wood pulp processes. There remains therefore the use which is potentially the largest and also the most important of all—the use of lignin as a source for numerous and varied organic chemicals which are daily playing a much larger part in all of industry.

Alkali lignin and other lignins have been tested experimentally for the production of various organic chemi-

cals, and the list of those that have been prepared by different treatments is extremely long and varied. At the present time only two chemicals, vanillin and acetovanillone, are being derived from lignin as a base material. Yet such items as protocatechuic acid, pyrocatechol, and oxalic acid may be made available by alkali fusion; also methanol, acetone, acetic acid, various phenols, alcohols, and neutral components as well as small quantities of acids. These reactions are just a few of the tools available to the chemical industry today. Applied with others to a material as abundant as alkali lignin they will help to better the process industries in the not too distant future.

J. J. Kellen and P. R. Wiley, West Virginia Pulp & Paper Co.

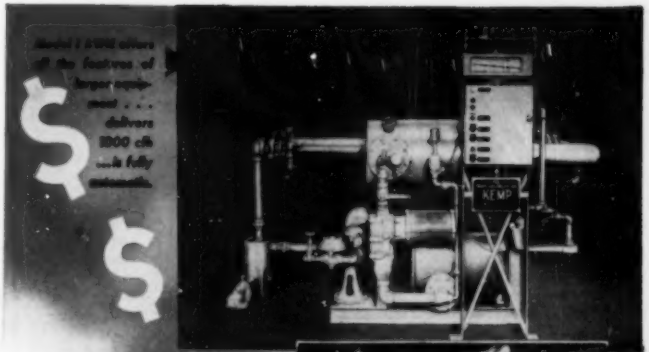


HEAT TRANSFER
. . . *New Down-Draft Kiln*

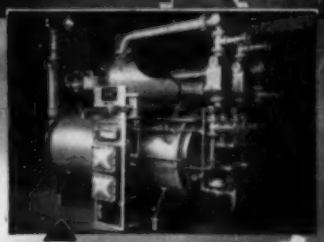
Big fault of conventional shaft lime kilns is non-uniform burning—the hot passages keep getting the most heat. A new concept in kiln design, recently off the drawing boards of Toledo Engineering Co., eliminates this fault by means of "down-draft" burning.

The new kiln, described by the company's president, J. G. Schwalbe before the National Lime Association, stands procedure on its head. Gases being heated travel upward through the heating mass. Gasses giving up heat, or cooling, travel downward.

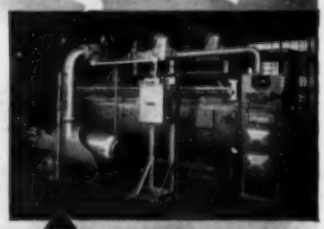
Design calls for automatic controls. Pressure differentials and gas flow are automatically maintained. Gases therefore within the kiln travel in ways designed for uniform distribution of heat. *(Continued)*



It pays to GENERATE your own INERTS



Model 6 MIHE is ideal for purging, bubbling and blanketing in synthetic resin plants . . . delivers 6000 cfh.



Model 60 MIHE produces 60,000 cfh . . . is widely used for purging and blanketing in the petroleum industry.

Kemp Inert Gas Generators Save $9 of the $10 you now spend for Inerts

Need inerts for purging, fire protection, mixing, blanketing or a special application? You can save up to 90% on Inert Gas costs when you generate your own inerts with a Kemp Inert Gas Producer. The cost of transportation, bottle juggling, storage, deposits on cylinder inventories and the initial higher cost of bottled nitrogen or CO_2 is eliminated.

ABSOLUTELY DEPENDABLE

No matter what the demand, Kemp Inert Gas Generators give you the same analysis Inert Gas from 20% to 100% of capacity. The Kemp Industrial Carburetor, part of each installation, burns ordinary gas just as it comes from the mains. Assures complete combustion without "tinkering." Produces a clean, chemically inert gas to meet your most exacting requirements.

SEND FOR DATA

Whatever your requirements, always specify Kemp. *To find out how you can benefit:* Tell us your atmosphere gas problem, and we'll show you how Kemp can solve it and save you money!

KEMP OF BALTIMORE

INERT GAS GENERATORS

Write for Bulletin I-10 for technical information C. M. KEMP MFG. CO. 405 E. Oliver St., Baltimore 2, Md.

FURAFIL* IS

COMMERCIALLY AVAILABLE, LOW IN COST...

Furafil is a free-flowing, pulverized organic material, readily available at modest cost throughout the year. It is capable of absorbing its own weight in water but is not hygroscopic.

Established uses for Furafil are to condition salts and similar materials which tend to cake, and as a burn-out filler or bulking agent where controlled ignition characteristics are important.

Furafil may also be useful to you as a source of carbon, as an absorbent for liquids, and as a filler. A special finely ground grade, Furafil 100, is offered as an extender for plywood adhesives and as a filler for specialty phenolic molding powders.

Furafil is produced commercially at two plants (Furafil C at Cedar Rapids, Iowa and Furafil M at Memphis, Tennessee) and is shipped in carloads, bulk or bags.

PROPERTIES: (Analyses on moisture free basis)

Color	Dark Brown
Bulk density	30–35 lbs./cubic foot
Odor	Coffee-like
ph (water extract)	2–3
Cellulose (Bray method using 72% H_2SO_4)	38%
Residue from saccharification (lignin and resins)	42%
Ash	4–5%

Screen Analysis:

	Furafil C	Furafil M
Thru 48 mesh	43%	45%
Thru 100 mesh	10%	23%

The best way to learn the applicability of Furafil in a given possible use is by actual tests. A request on your business letterhead will bring you a sample and a copy of our Technical Bulletin No. 123-B describing Furafil.

*Reg. U. S. Pat. Off.

The Quaker Oats Company — CHEMICALS DEPT.

3350 The Merchandise Mart • Chicago 54, Illinois
P. O. Box 4376, Dept. 50 • Portland 8, Oregon

DOES RESEARCH PAY OFF?

Du Pont has stated that 60 percent of their sales in 1950 came from products that were unkonwn or in the research and development stage in 1940.

Claims are, the new kiln, unlike conventional ones, overcomes any tendency toward channeling. By proper regulation gases establish a heat equilibrium and distribute themselves evenly over the cross-sectional area.

Another claim: hot spots at the burning zone perimeter are done away with.

How It Functions: In the cooling zone hot lime heats the incoming air. Preheated air passes from the cooling to the burning zone. Some of the air (excess) passes upward and out the burning zone port. Lime is uniformly cooled to 250 deg. F.

In the burning zone fuel gas and preheated air enter. The hot combustion gases pass down the zone and out the port. Volume of gases removed through the ports are automatically maintained in fixed relation to the fuel gas input. These hot gases are too hot for a fan so blending air is introduced to lower the temperature to about 1,400 deg. F.

In the preheating zone: the hot combustion gases enter. They pass downward and out automatically controlled vents at about 1,200 deg. F. Pressure is maintained at the ports by the vents. It is slightly higher than that of the fuel and air ports directly below.

In the storage zone: About 23 percent of the hot combustion gases move through this zone to maintain a positive pressure. They leave through adjustable vents at 300 deg. F.

In the buffer zones: Both zones are gaseous seals formed by automatically controlled pressure differentials. In the upper zone the seal prevents fuel gas and combustion air from moving upward. In the lower it prevents recarbonization.

EMPLOYMENT

. . . *Engineering Trends*

If anyone should know the employment outlook for engineers, the Bureau of Labor Statistics should. In a recent bulletin published by them Commissioner Ewan Clague shinnied out on a statistical limb in predicting several employment trends. They are:

• About 7,500 young engineers will be needed yearly in the near future to fill vacancies arising from deaths and retirements. Toward the

DARK DAYS AHEAD?

"In 1954 there will be only about 12,000 engineers graduating . . . In the next four to five years there probably will not be enough people with technical training to run our industry."

JESS H. DAVIS, *President Stevens Institute of Technology*

end of the decade, about 9,000 will be needed annually.

• Average annual demand for engineers during a prolonged partial mobilization—at least 30,000.

• Engineering graduations will decline sharply from the peak figure of 52,000 in 1950, when the greatest number of veterans completed their training.

• Not all students graduating from engineering schools in the next few years will be available for civilian employment. Reason: called to military service.

• There will not be enough engineering graduates to meet expected defense and civilian needs, at least until the mid-1950's and probably for some time after.

• Long-term growth can be met only if the proportion of high school graduates going into engineering is much larger in the next few years than in 1950 and before the war.

SULPHUR

. . . *Recovery From Coal*

For years British sulphur recovery has lagged behind French methods. However, recent developments show the English engineers intend to catch up. And their gain is ours.

In this country the latest thing from Britain may be useful in more ways than one. A new sulphur recovery process, described by Britishers, S. R. Craxford, A. Poll and W. J. S. Walker before the recent meeting of International Congress of Pure and Applied Chemistry, has caught the eye of two groups: the pollution and the sulphur people.

The process washes flue gas from burning coal with a solution of ammonia. It recovers sulphur as ammonium sulphate and some free sulphur. Recovery is better than 95 percent.

After testing in a pilot plant treating 1,000 cu. ft. of flue gas per hr., a plant was built treating 25,000 cu. ft. an hr. Object was to determine probable commercial costs. Earlier estimates placed costs at $1.26 per ton of coal burned, after allowing credits for the sulphur recovered.

Process consists of scrubbing the gases with a solution of ammonia. The scrubber liquor is then heated

NO. 2 OF A SERIES ON HOW TO

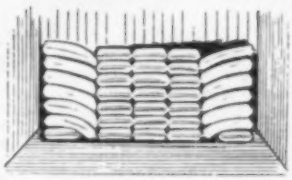
Stretch a MULTIWALL Paper Bag

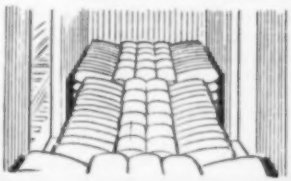
Kraft paper supplies are short. So it is important for you to get the best use from your multiwalls. Here is one way to stretch them . . .

PROPER CAR LOADING

PREPARATION IS IMPORTANT

Cars should be clean, dry, and free from protruding nails or other projections. Remove all dirt, dust, rocks and grit. Remove loose nails and cover loose bolts with cardboard or several thicknesses of car liner. (Picture shows how to use straight-edge board to locate protruding nails, etc.). Cover floor (and walls, if necessary) with good grade of car liner and put at least three thicknesses on door edges. Use asphalt-laminated paper to seal door cracks.





FOLLOW THESE LOADING RULES:

1. The car should be loaded so that the filled bags will not come in contact with side doors. **a.** Use a good grade of dunnage in the doorway or steel strapping covered with corrugated board. **b.** Follow proper loading patterns. (Illustrated.) **c.** Use retaining strips of special Scotch tape applied across the load, or steel retaining straps covered by one thickness of corrugated board.
2. Bags should be loaded tightly, solidly and flat, to minimize shifting.
3. Balance the load from end to end and side to side. There are, in general, three loading methods—crosswise, brickwall and lengthwise. Crosswise is generally preferred. Loading in car doorways should be done so that this part of the load acts as a keystone between the end loads. (See illustration.)

Want the Whole Story?

Ask your Bemis Man for free, illustrated copy of Bemis Multiwall Packaging Guide. It deals with Storage, Filling and Closing, Handling, Palletizing and other important subjects.

• • •

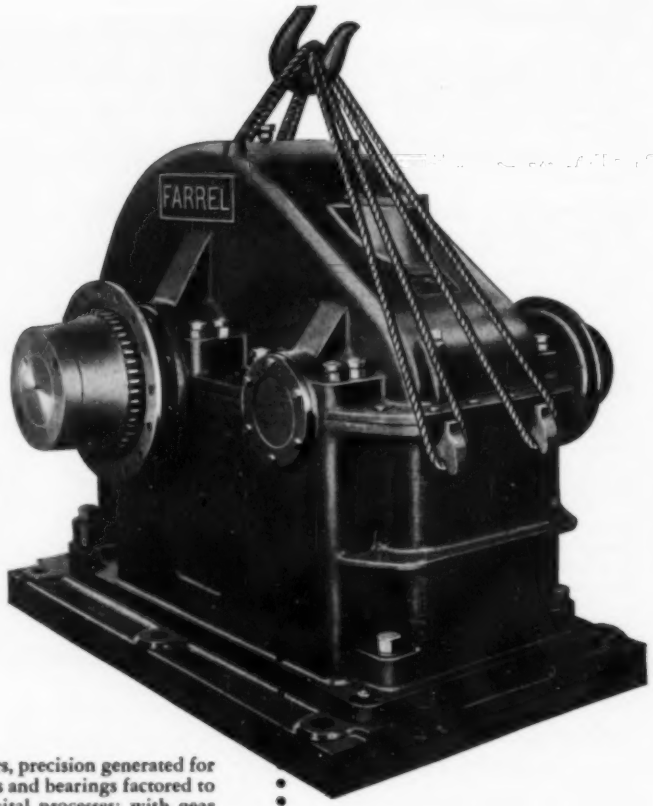
Maybe Cotton Bags are Your Answer . . . if you can't get all of the multiwalls you need. Cotton bags are available . . . and Bemis is the leading cotton bag source.

Bemis

BEMIS BRO. BAG COMPANY

St. Louis 2, Missouri

FARREL® SPEED REDUCERS



THEY ARE MADE with Farrel-Sykes gears, precision generated for smooth, quiet operation; with shafts and bearings factored to safeguard against interruption of vital processes; with gear cases proportioned to withstand repeated heavy peak loads. These are standard features of design, incorporated to assure long, trouble-free performance under normal operating conditions.

FOR UNUSUALLY SEVERE SERVICE, THEY ARE MADE with gears, shafts, bearings, and even some housing dimensions, proportioned to meet specific load, speed and operating conditions. Because of this flexibility in design, Farrel speed reducers have provided the solution to innumerable application problems.

WRITE FOR COMPLETE DETAILS. *Ask for a copy of Bulletin 449—no cost or obligation.*

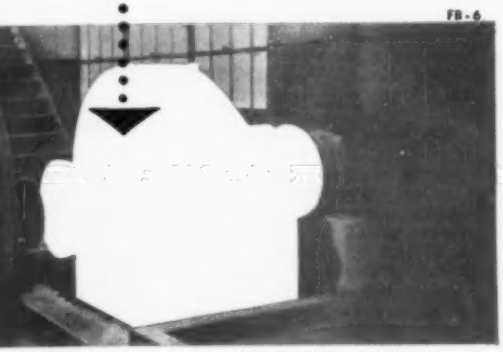
are made to fit your requirements

FB-6

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham



QED, cont. . .

in an autoclave to produce a good quality ammonium sulphate together with a little free sulphur.

Big problem in its development was to prevent ammonia and sulphur dioxide loss in the gas leaving the scrubber. Solution was an electrical method for measuring and recording the vapor pressures of the sulphur dioxide and ammonia in equilibrium with the scrubber liquor.

FLUIDIZATION

. . . *New and Useful Equations*

How would you determine the fraction voids in a fluidized bed of fine solids in liquids? For example, determine the fraction voids for the fluidization of cracking catalyst with upflowing liquid hydrocarbons.

A number of experimental investigations have been carried out, and some correlations have been made that would help answer the question. But until E. W. Lewis and Ernest W. Bowerman of Humble Oil and Refining Co. told the recent meeting of the South Texas section of the AIChE the correlations of their latest work, the answer would be indeed difficult to give.

"These correlations are new, consistent, and easily used for predicting performance of batch liquid-solid systems over the full range of fluidization conditions," say Lewis and Bowerman.

They are:

▶To find the fraction voids, use the following dimensionless equation:

$$\epsilon = 1.389 \left[\frac{u_o \mu}{g D_p^2 (\rho_s - \rho)} \right]^{0.1181}$$

where ϵ is the fraction voids in the fluidized bed of solids; u_o, the superficial liquid velocity; μ, liquid viscosity; g, gravitational constant: D_p the particle diameter; ρ_s, density of solid saturated with liquid; ρ, liquid density. (This equation differs from that for constant diameter spheres only in the constants.)

▶For particle Reynolds numbers from 2 to 500, and uniformly sized spheres, use this equation:

$$\epsilon = 1.95 \left[\frac{u_o \rho^{0.29} \mu^{0.43}}{g^{0.71} D_p^{1.14} (\rho_s - \rho)^{0.71}} \right]^{0.337}$$

▶For particle Reynolds numbers between 500 and 200,000 (at the free-falling velocity for a single particle), and constant diameter spheres:

$$\epsilon = 0.907 \left[u_o \sqrt{\frac{\rho}{g D_p (\rho_s - \rho)}} \right]^{0.430}$$

—End

SARAN LINED steel pipe

Cut "downtime" to a minimum! Saran lined steel pipe can be cut and threaded in the field as easily and quickly as ordinary steel pipe—involving NO costly delays with special tools or handling. And, once installed, saran lined steel pipe means dependable long term operation. In addition to excellent corrosion resistance, this remarkable pipe offers you the plus values of rigidity and pressure strength.

These advantages are of prime importance to you in the reduction of shut-down time and equipment replacement. INVESTIGATE saran lined steel pipe today! Mail this coupon for full information. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

Distributed by

Saran Lined Pipe Company

2415 BURDETTE AVE. • FERNDALE, MICHIGAN
With Offices in: New York • Boston • Philadelphia Pittsburgh • Chicago • Tulsa • Portland • Indianapolis San Francisco • Houston • Denver • Seattle • Los Angeles • Cleveland • Charleston, S. C. • Toronto

send today!

Please send me your catalogue containing detailed information on Saran Lined Pipe, Valves and Fittings.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____

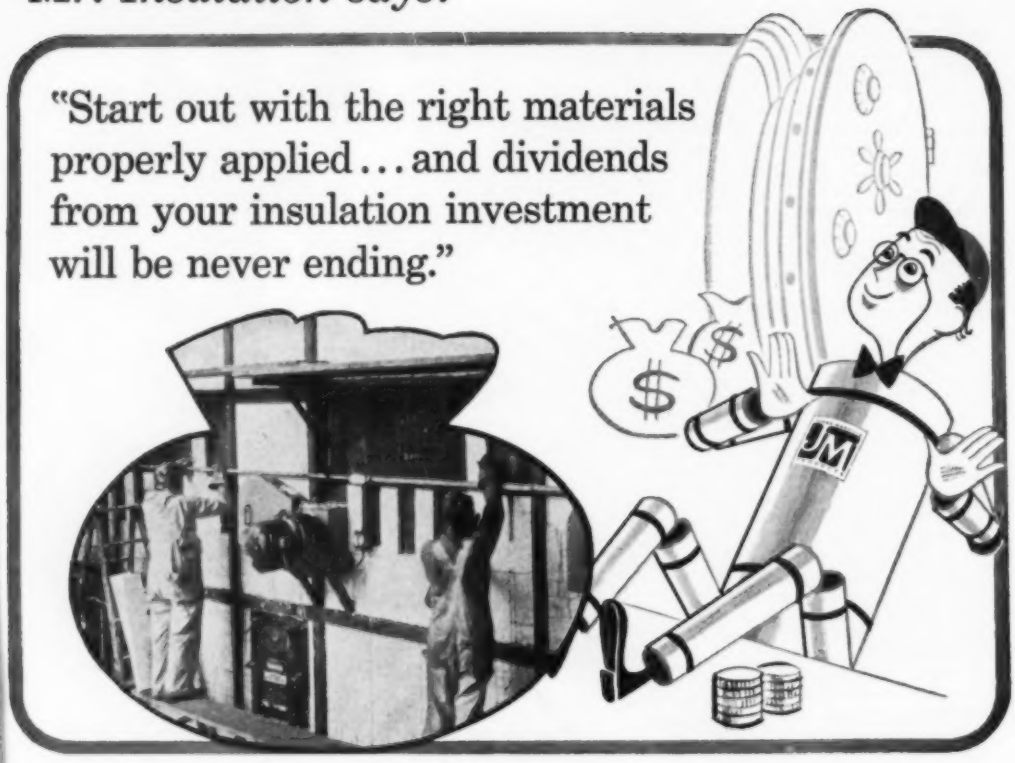
STATE_____

SP-48

SARAN LINED PIPE
is a
DOW
product

Mr. Insulation says:

"Start out with the right materials properly applied... and dividends from your insulation investment will be never ending."



Here are two important reasons why it will pay you to let Johns-Manville serve as your insulation headquarters:

YOU GET THE RIGHT MATERIALS — Regardless of the service conditions on your job, Johns-Manville has an insulation that fits the need. That's because Johns-Manville manufactures a wide variety of insulations of asbestos and other selected raw materials—for service from 400F below zero to 3000F above. Johns-Manville offers this complete line because industry requires many types of insulations and because no one material can properly serve as a jack-of-all trades for use on all jobs.

YOU GET THE RIGHT APPLICATION— Insulations serve at top efficiency only when properly applied. J-M Insulation Contract Firms have men with generations of insulation experience and training in Johns-Manville application methods. The way they engineer your job is your assurance that your insulation investment will pay a high return through the years.

Why not call on insulation headquarters for engineering advice about your insulation work. J-M Insulation Engineers are available to help select the *right* insulation for your particular service conditions. Write Johns-Manville, Box 290, New York 16, N.Y.

JM

Johns-Manville *first in* **INSULATIONS**

Chemical Engineer's Bookshelf

Edited by Lester B. Pope

Through 1949

SYNTHETIC METHODS OF ORGANIC CHEMISTRY, VOL. V. By W. Theilheimer. S. Karger A. G. Verlag, Basel & New York. 612 pages. $14.

Reviewed by Edgar A. Steck

This fifth volume of "Theilheimer" should need no advertising for the pot-boilers and molecule-mechanics who have been grateful for the help rendered by earlier volumes of the series. Dr. Theilheimer's careful abstracting of methods from the literature has been completed through 1949, and a number of 1950 references have been included as well. The broad scope of coverage of the first five volumes has been well attested in this one, which contains a cumulative index for all. There has been no deviation from the convenient Weygand-type system of reaction-symbols and the work is neatly handled. The correlation of data and other aspects of the series cause it to merit the highest praise. Typographical errors and deviations in nomenclature are amazingly rare.

Continuation of the series is a great need for those responsible for developments through organic synthesis. It is hoped that many additional firms will join the group of seventeen companies which have contributed to the financial support of the work. To those patrons of the chemical literature much is owed.

The publishers have continued to treat the task kindly and well, with clear type, well set. The user can only hope that further volumes may be bound in darker material, for the present buff bindings show signs of wear easily. No complaints about the price, when such value is received as Dr. Theilheimer offers in his series.

Exhaustive Detail

COMBUSTION, FLAMES AND EXPLOSIONS OF GASES. By Bernard Lewis and Guenther von Elbe. Academic Press, New York. 795 pages. $13.50.

Reviewed by G. F. Kinney

The purpose of this new book is to provide the scientist and the engineer with a basis for understanding combustion and explosion phenomena. The title is identical to that of a previous work by the same authors, but the volume is approximately doubled in size. As previously, there is a division into four parts, each of which begins with a cursory treatment of theoretical considerations, followed by multitudinous empirical observations. Part I considers reactions between oxygen and fuel gases; Part II is concerned with flame propagation; Part III deals with the properties of combustion products, and Part IV takes up selected practical applications.

The combustion process has associated with it many of its own peculiar problems, such as the blow-off and flash-back limits characteristic of the various fuel gases. But combustion is also of great concern in many diverse applications as, for example, in the internal-combustion engine. In the preface it is pointed out that the knock-limited performance of the Otto engine can be estimated rather simply from basic theory, and that such is much less expensive and perhaps even more useful than data obtained exclusively from engineering-type tests on over-all performance.

Much of the material is considered in exhaustive detail. This, of course, is desirable for a specialist in the field, but also has a disadvantage in that it becomes difficult for a casual reader to find a unifying train of thought. The authors continue their private convention of regarding increases in a property as algebraically negative, and hence must read from right to left the chemical equation representing equilibrium.

If You Are Wondering

RADIOACTIVITY APPLIED TO CHEMISTRY. Edited by Arthur C. Wahl and Norman A. Bonner. John Wiley & Sons, New York. 604 pages. $7.50.

Reviewed by F. C. Nachod

If one deliberates a program of radioactivity research in the solving of chemical problems this is a step not to be taken lightly. If one goes outside of the scope of conventional chemical methods one must be armed with a good understanding of new methods, new techniques and new equipment; furthermore one must be able to evaluate critically the powerful new tools one wishes to bring to bear upon these problems. The book ably edited by Drs. Wahl and Bonner with the cooperation of authors Barnes, Burgus, Crompton, Garner, Kahn, Linnenbom, Miskel, Myers, Prestwood and Wang is a tremendously helpful guide for one needing such counsel. It is divided into two (about equal) parts.

The first part consists of 10 informative chapters on such topics as exchange reactions, kinetics, structural and analytical chemistry, self-diffusion, carrier-free tracers, new elements, hot-atom chemistry, emanation methods and surface studies. The second part provides eighteen tables and six appendixes. It is this portion of the book particularly which is of immense value to the worker once he has taken the plunge and is engaged in radioactive studies.

The book is recommended for the researcher engaged in radioactivity studies as well, and perhaps even more so to the one who is not, but who wonders whether he should be.

From Switzerland

DIE BIOGENEN AMINE. By M. Guggenheim. Interscience Publishers, New York. 619 pages. $19.50.

Reviewed by J. I. Grant

The latest edition of Dr. Markus Guggenheim's well-known text "The Biogenic Amines" which appears 10 years after the third edition covers the world literature through 1950. Over 5,000 references are cited. The monumental task involved in reading and studying 5,000 papers could only be accomplished by a scientist who devotes his life to his subject.

Like the third edition, the present one is a comprehensive survey of low molecular weight organic bases evolved during the life processes of animals, plants and bacteria. A 66-page general section on the definition, classification, history, biochemistry, physiology, pharmacology, isolation and testing of the biogenic amines is followed by 539 pages on the occurrence, biogenesis, physiological function, biochemical and pharmacological role, properties and salts, identification and isolation of the individual biogenic amines (i.e., adrenaline, arterenol, histamine, choline, acetylcholine, creatine, creatinine, etc.). The enzyme systems utilized in anabolism and catabolism of natural amines receives prominent treatment. Correlation of chemical structure with specificity of action is emphasized.

BENDIX FRIEZ

Bendix-Friez
THERMISTORS
(NEGATIVE TEMPERATURE CO-EFFICIENT CERAMIC RESISTORS)

● These temperature responsive resistors are useful as temperature measuring elements and as liquid level sensors; they are especially well suited to compensation where the circuit constants must be maintained irrespective of temperature changes. Since they are a fired ceramic, they are stable under practically all conditions and respond only to temperature changes.

Many other values can be obtained from standard diameter material. Because the thermistors are made in our own plant, under extremely careful control, special compositions, shapes, and resistance values, hermetically sealed or otherwise protected, can be made in any quantities to suit your individual requirements.

We invite your Inquiries

BENDIX-FRIEZ STANDARD ROD TYPES

Write Dept. G

Size (inches)	@ +30°C.	@ 0°C.	@ −30°C.
.140 x ¾	45 ohms	88 ohms	193 ohms
.040 x 1.5	14,000 ohms	29,946 ohms	74,676 ohms
.018 x 1.5	40,000 ohms	94,040 ohms	262,400 ohms

Typical application in capsule form for temperature sensing of hydraulic oil. .

FRIEZ INSTRUMENT DIVISION of
1324 Taylor Avenue • Baltimore 4, Maryland
Export Sales: Bendix International Division, 72 Fifth Ave., N.Y. 11, N.Y.

Bendix AVIATION CORPORATION

Which ALLOY MEETS YOUR FASTENING PROBLEMS?

ALUMINUM
BRONZE
COPPER
STAINLESS
BRASS
MONEL

Let HARPER Help. Here are *all* kinds—with exactly the right alloy, size, type and finish you need. Harper specializes in nonferrous and stainless steel fastenings for services in all industries where resistance to corrosion, abrasion, heat and stress is vital. Over 7000 items—bolts, screws, nuts, rivets, and accessories—in stock ready for immediate delivery from warehouses and distributors, coast to coast. For latest catalog, mail coupon.

HARPER
EVERLASTING FASTENINGS

The H. M. Harper Co.,
8206 Lehigh Ave., Morton Grove, Ill.
Rush my copy of the Harper Catalog.
(Please Print)

Name.....
Address.....
City.....State.....

SPECIALISTS IN ALL NON-CORROSIVE METALS

BOOKSHELF, cont. . .

Scientific workers in the medical field, in inorganic, organic, physical engineering or biological chemistry, physiology, pharmacology, bacteriology and botany who do not read German would be benefited by an English translation of Dr. Guggenheim's excellent book.

Phases & Forces

PHASE TRANSFORMATIONS IN SOLIDS. Edited by R. Smoluchowski, Chairman, J. E. Mayer, and W. A. Weyl. John Wiley & Sons, New York. 660 pages. $9.50.

THE SURFACE CHEMISTRY OF SOLIDS. By S. J. Gregg. Reinhold Publishing Corporation, New York. 297 pages. $8.50.

Reviewed by G. F. Kinney

"Phase Transformations in Solids" is a collection of seventeen independent papers. These were presented at a symposium sponsored by the National Research Council Committee on Solids, and held at Cornell University in June 1947. The list of authors is an impressive one. The first six papers (211 pages) are largely theoretical and consider topics such as nucleation theory, diffusion, and the general theory of place transformations. The second group (6 papers, 131 pages) considers transformations in non-metals such as glass and ceramics. The third group (5 papers, 318 pages) is devoted to transforma-

RECENT BOOKS RECEIVED

Basic Methods of Marketing Research. By J. H. Lorie & H. V. Roberts. McGraw-Hill. $6.

Chemical Trade Names and Commercial Synonyms. By W. Haynes. Van Nostrand. $5.50.

Food and Food Products. Vol. III. 2nd ed. By M. B. Jacobs. Interscience. $15.

Fluorine and Its Compounds. By R. N. Haszeldine & A. G. Sharpe. Wiley. $1.75.

Heating Design and Practice. By R. H. Emerick. McGraw-Hill. $8.

Hydrogenation of Fatty Oils. By H. I. Waterman. Elsevier. $6.50.

Materials Technology for Electron Tubes. By W. H. Kohl. Reinhold. $10.

Organic Chemistry. By J. P. Wibaut. Elsevier, $9.

Paint and Varnish Production Manual. By V. C. Bidlack & E. W. Fasig. Wiley. $6.50.

Pulp and Paper Manufacture. Vol. 2. By J. N. Stephenson. McGraw-Hill. $7.50.

States of Matter. By H. S. Taylor & S. Glasstone. Van Nostrand. $12.

Synthetic Resins and Allied Plastics. By R. S. Morrell. Oxford. $10.

The Theory of Isotope Separation. By K. Cohen. McGraw-Hill. $2.

"ZEPHYRWELD"® WELDING FITTINGS . . . SS Type 304-347-316—Inconel and other SS analyses. Fabricated in O.D. Pipe and Tube Size, ½ in. thru 24 in.—ells, tees, adapters, etc. Covered in Catalog 748.

RECESSED-END FITTINGS . . . Stainless Type 304-347-316. Low cost, light weight fittings for fast, simple soldering, brazing or socket welding. Sizes from ½ in. thru 24 in. Full line of elbows, tees, adapters, etc. Covered in Catalog 948.

Try

TRI-CLOVER

CLAMP-TYPE CONICAL FITTINGS . . . requires only 1 simple ferrule, assures leak-tight joints thru sanitary Teflon gaskets. Fast, simple assembly and disassembly. Full line in sizes from 1 in. thru 4 in.

SANITARY TYPE FITTINGS . . . Stainless Steel and Tri-Alloy (Nickel Alloy), from 1 in. thru 4 in. O.D., full range of fitting types. Approved as meeting 3A Standards throughout, incorporating exclusive design features. Covered in Catalog 150-B.

CONICAL END FITTINGS . . . Stainless Type 316—Inconel and other SS analyses. Complete line, sizes from 1 in. thru 4 in. O.D. Features: Light weight—low cost—fast installation—leak tight—easily adapted to other fitting types. Covered in Catalog 848.

. . . for the COMPLETE LINE of*
LOW-COST CORROSION-RESISTANT PIPING
. . . in both Tube O.D. and Pipe O.D. types

Here you see five representative fitting types that go to make up the complete Tri-Clover line—all available from one source. Install these stainless steel or alloy products in your process lines and realize the advantages of increased production and lower maintenance cost. 32 years of specialized experience in solving corrosion piping problems can be yours by consulting our engineers.

Write for details, or see your nearest Jobber.

***ALL FROM 1 SOURCE**

The COMPLETE Tri-Clover Line includes:

- Flared Tube Fittings (Concentric)
- Tube O.D. Buttweld Fittings (Zephyrweld)
- I.P.S. O.D. Sch. 5 and 10 Buttweld Fittings (Zephyrweld)
- I.P.S. O.D. Sch. 40 and 80 Buttweld Fittings
- Flanged Contact End Fittings (Tube O.D.)—1" Through 4"
- Industrial Recessed End Fittings (Tube O.D.) 1" Through 10"
- Screwed and Flanged Valves (Powell)
- Special Fabricating Facilities
- 3A Standard Sanitary Fittings and Valves (Stainless Steel and Tri-Alloy)
- All-Sanitary Magnetic Full-Flow Traps
- Centrifugal Pumps—Sanitary and Industrial
- Stainless Steel Tubing and Pipe—All Sizes and Analyses

(Inventories carried in distributors' stocks strategically located throughout the United States.)

Tri-Clover®
MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

tions in metals. Topics include order-disorder, precipitation and aging, and the eutectoid and martensitic transformations that are of such importance in the iron-carbon system.

One announced objective of the symposium was to stimulate progress toward an understanding of the transformations by bringing together outstanding people from the diverse fields of chemistry, physics, metallurgy and crystallography. As such it was eminently successful, and a tangible result is this outstanding publication.

The unifying thought throughout the survey "The Surface Chemistry of Solids" is that surface effects are traceable primarily to two force fields, that of some external particle and that of the solid acting outward. Forces acting outward from the solid are presumably identical with those acting inward and holding the material together. The phenomena of adsorption and adhesion are directly connected with such forces, and are discussed briefly but adequately. Other items included are applications of the electron microscope, friction and lubrication, chromatography, and catalysis. The book is a very readable factual survey of a complex field. It is a welcome addition to the literature.

+ Helium II

HEAT AND THERMODYNAMICS. By Mark W. Zemansky. McGraw-Hill Book Co., New York. 465 pages. $6.

Reviewed by G. F. Kinney

This new third edition of a standard text differs from its predecessors chiefly by devoting a separate chapter to the physics of very low temperatures. Here is described the superfluidity of helium II, the fountain effect, adiabatic demagnetization, superconductivity, and the third law. There is also some expansion of the material on heat transfer, and the addition of a number of new figures and problems.

The volume is designed to serve as an intermediate textbook for students of theoretical physics. The emphasis is on the general principles of the science. Descriptive material is introduced to make those principles realistic and comprehensible, but diverting minutiae are avoided. The result is a work outstanding in its clarity, and well adapted not only as a text but also as a general reference for engineers, chemists, and others in the scientific field.

—*End*

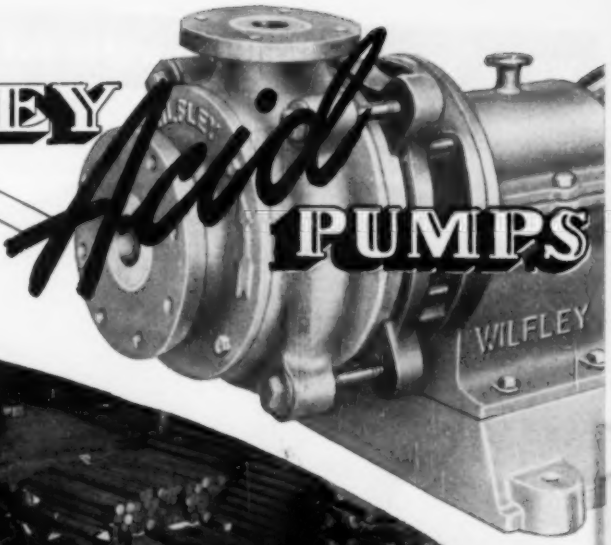
Recent Books & Pamphlets

Subject	Summary	How to Order
Catalysts	Their selection, manufacture and recent industrial applications. What to consider when selecting catalysts. Manufacture of both preformed catalysts and catalytic chemicals is covered. Section on applications includes synthetic detergents, resins, synthetic rubber, aromatics and aviation gas. 12 pages.	Reprint No. 184. Editorial Dept., Chemical Engineering, 330 West 42nd St., New York 36, N. Y. 25 cents.
Manpower	Report on a survey of 42,000 of the nation's top scientists. Comprehensive data on such questions as: how many scientists are there in different specialties; how old are they; what education did they receive; how much experience have they had; where are they employed; how much do they earn. 48 pages.	"Employment, Education and Earnings of American Men of Science." Bureau of Labor Statistics Bulletin 1027. Superintendent of Documents, Washington 25, D. C. 45 cents.
Professional Development	Engineers' Council reports of the chairman, the standing and special committees, the representatives of constituent societies, lists of accredited and undergraduate engineering curricula and technical institute programs, and financial statement for the year 1950-51. 58 pages.	"Nineteenth Annual Report." Engineers' Council For Professional Development, 29 West 39th St., New York 18, N. Y. 50 cents.
Petroleum Products	In compact, readily usable form, most of the ASTM standards, test methods, and specifications widely used in this field. Some classifications covered include butadiene, petroleum solvents and naphthas, lubricating oils, petroleum sulphonates. 804 pages.	"Standards on Petroleum Products and Lubricants." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $5.75.
Coal	Details such subjects as energy, reserves, production, transportation, markets, labor, safety, research, and finance. Up to date statistics, new photos, charts, and graphics printed in color. 204 pages.	"1951 Bituminous Coal Annual." Bituminous Coal Institute, Southern Bldg., Washington 5, D. C.
Catalysts	Describes work conducted during 1950 to determine the effects of various kinds of organic sulphur on nickel catalysts and the amounts which industrial units might be expected to tolerate when operated for the production of fuel gas. 24 pages.	"Sulphur Poisoning of Nickel Catalysts." By C. H. Riesz, H. A. Dirksen and W. J. Kirkpatrick. Bulletin 10, Institute of Gas Technology, 17 West 34th St., Chicago 16, Ill. $2.50.
Carbonization	Recommendations for a comprehensive program of research to establish the fundamental factors governing the expansion behavior of coals and coal blends during carbonization. 60 pages.	"Expansion Behavior of Coal During Carbonization." By O. P. Brysch and W. E. Ball. Bulletin 11, Institute of Gas Technology, 17 West 34th St., Chicago 16, Ill. $5.
Metallizing	Technical as well as practical aspects of the process. Various methods of surface preparation and the application of metallized coatings for machine element work, for corrosion work, and for many special production jobs. Profusely illustrated with photographs, diagrams and charts. 250 pages.	Metallizing Engineering Co., 38-14 30th St., Long Island City 1, N. Y. $3.

—*End*

WILFLEY Acid PUMPS

A shipment of Wilfley Acid Pumps destined for a South American installation.



Today's demand for increased production in the chemical industry has spotlighted the absolute dependability of WILFLEY Acid Pumps. In chemical plants all over the world this great pump is making impressive production records in low-cost handling of acids, corrosives, hot liquids, mild abrasives and other solutions. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Wetted parts of practically all machinable alloys. Plastic lined models available. Individual engineering on every application.

Companion to the famous Wilfley Sand Pump

Bulletin E-7000 shows Model "AF" Acid Pumps in direct-drive, belt-drive and overhead belt-drive models. Write or wire for your copy today.

Buy Wilfley for Cost-Savi

A. R. Wilfley & Sons, Inc. Denver, Colorado, U.S.A. • New York Office: 1775 Broadway, New York City

we've "squeezed" all the water out of citric acid!

buy CITRIC ACID ANHYDROUS

and *Save* the cost of shipping and handling a gallon of water with every 100 pounds of citric acid

There are 8.58 pounds of water of crystallization in every 100 pounds of Citric Acid U.S.P., but there is *none at all* in Pfizer's Citric Acid Anhydrous. You save 8½ pounds in shipping weight for every 100 pounds of the U.S.P. material formerly used. You can save a ton on a truckload shipment!

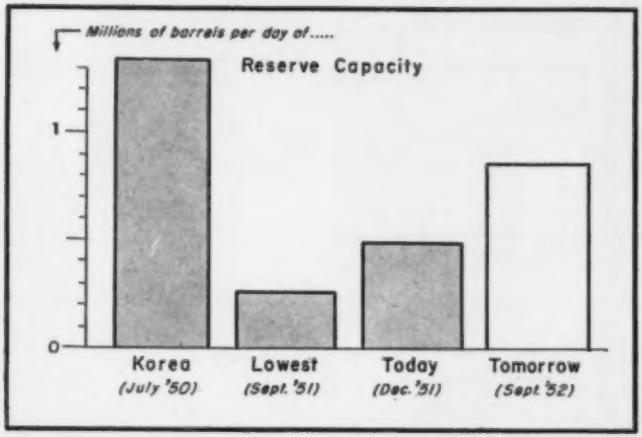
Pfizer Citric Acid Anhydrous is prepared by a special process developed in Pfizer's research laboratories. It cannot dry out, and it does not absorb water. Freedom from caking makes it easy to handle, cuts waste. Its composition remains absolutely constant, insuring uniform results.

Write for technical data and prices to

Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y.; 425 North Michigan Ave., Chicago 11, Ill.; 605 Third St., San Francisco 7, California.

PFIZER

Manufacturing Chemists for Over 100 Years



RESERVE producing capacity in U. S. up after dangerous drop.

Petroleum Strong Again?

Petroleum industry, overworked of late, is gaining new strength. However, reserve capacities are still below the danger point. A relapse is possible.

Boost in oil production—in the face of military requirements in Korea and the shut-down in Iran—ranks high as one of the industrial feats of the year. But it was achieved at a price: the virtual disappearance of the pre-1950 reserve capacity.

The petroleum industry was in tip-top shape at the time the Korean war exploded. It had spent $8 billion since World War II on an expansion program. These new facilities enabled the industry to meet a 30 percent jump in demand since 1945 and still set aside 1.3 million barrels a day in reserve producing capacity.

OVERWORK

Petroleum consumption jumped 12 percent in 1950 and 10 percent in 1951. This boost over the normal rate of increase—which varies between 4 and 5 percent—was due to military needs and the stepped up industrial activity called for by the mobilization program. And this peak demand came at a time when Iran—producer of 6 percent of the total world oil supply—ceased exporting.

Nevertheless, the oil companies met all demands—military, defense, civilian and export—without causing serious inconveniences to the consumers. American owned refining capacity in Europe turned out an additional 30,000 to 50,000 bbl. a day. And by boosting crude output at home the oil concerns made possible the diversion of vast quantities of Middle Eastern crude from United States refineries to overseas installations. If Iran had not shut down, about 220,000 barrels a day of Middle Eastern crude oil would have come to the United States. Rising oil output here made it possible to divert about 140,000 barrels.

While the threatened oil shortage has been averted, certain petroleum products remain in tight supply. It was feared that the loss of much aviation fuel would be cruelly felt. But United States production rose enough to keep the planes in the air.

Recent regulations by the Petroleum Administration for Defense have helped improve the tightness in aviation fuel. One new order forbids the use of products of suitable quality for any purpose other than the manufacture of aviation gasoline. And another requires the mixture of a specified quantity of tetraethyl lead in commercial grades of gasoline. These measures are expected to provide an additional 14,000 barrels of aviation gasoline a day.

But—in the process of hurdling all these obstacles—U. S. reserve producing capacity fell away to about 200,000 to 300,000 bbl. a day. And military leaders and state oil conservation commissioners became alarmed.

NEW STRENGTH

There are indications that this trend will soon be reversed. Signs on the horizon: (1) total oil demand in the third and fourth quarters of 1951 increased only 6.6 and 7.6 percent over the corresponding quarters of 1950—compared to gains in the first two quarters of 14.1 and 10.8 percent. (2) World oil production has hit an all-time peak of 12 million barrels a day. (3) In recent days Texas has cut its oil producing rate twice—and another cut is expected in late January.

Nearly all forecasts for 1952—by both industry and government—point to a further decline in the rate of oil demand growth. The consensus is that oil demand in 1952 will rise by a shade over 4 percent. And—barring a general war—it seems certain that within two years enlarged oil producing facilities will outrun any demand increases.

PAD figures that 1952 demand can be met with but a 2.3 percent step-up in domestic oil flow and a 2.4 percent boost in refinery runs.

Industry expects that reserves producing capacity can be boosted to nearly 800,000 bbl. daily by the third quarter of 1952. However, a big question mark—other than the course of world politics—is the policy of the Defense Production Administration on steel allocations.

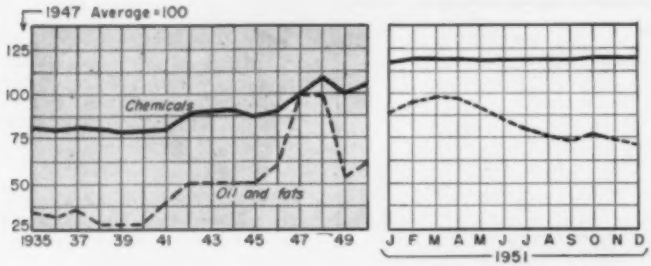
POSSIBLE RELAPSE

A relapse is possible if government—taking its cue from the eased oil supply situation—should decide to curtail the industry's steel allocation, it would put a severe dent in the increase in reserve capacity. And the present reserve cushion of a few hundred thousand barrels a day is very thin compared to the more than 1 million barrel a day pre-Korean reserve capacity.

Without that million barrel a day reserve, western industry might have been crippled by a fuel shortage. The oil industry is ready to start building up this safety margin again. And the size of its steel allocation is a top priority defense question.

Process Industry Trends

PRICES

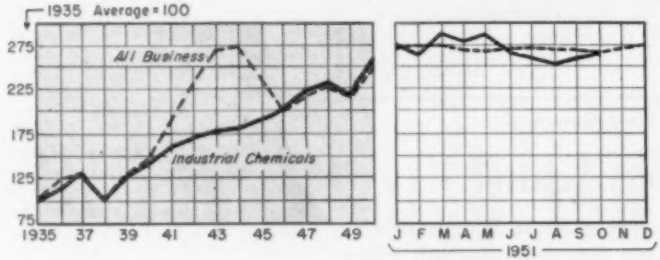


Chemical Engineering's Price Indexes

Chemicals – Up +0.6%
Oils & Fats – Down –6.8%

	Chemicals	Oils & Fats
As of Jan. 1, 1952	121.62	68.26
Last month	120.94	71.12
January, 1951	117.96	88.68
January, 1950	99.37	48.19

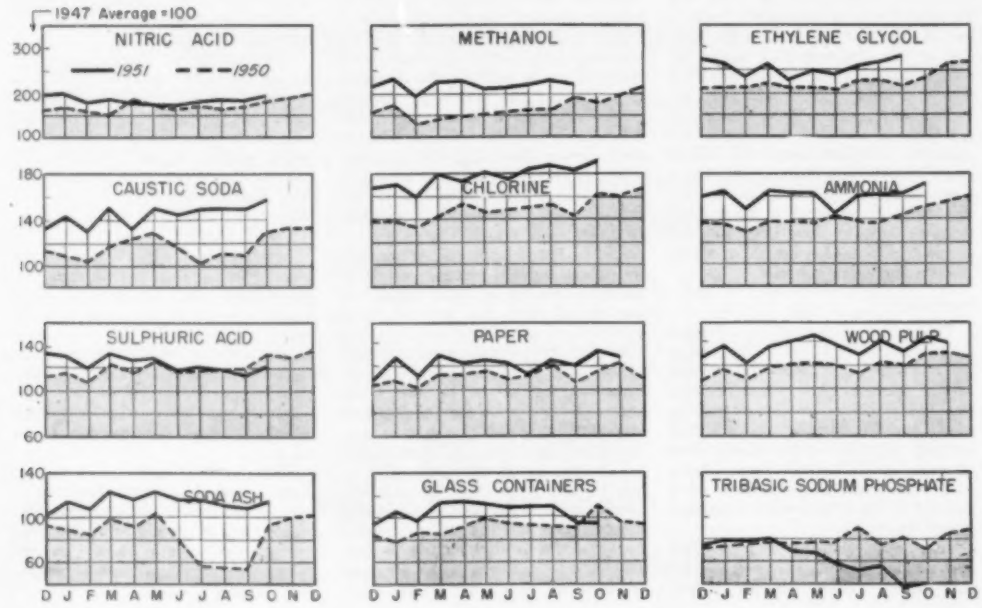
CONSUMPTION



Industrial Chemicals Index

	Nov. (Est.)	Oct. (Prelim.)	Sept. (Revised)
INDEX	257.50	266.43	252.66
Fertilizer		54.44	48.74
Pulp and paper		31.49	28.23
Petroleum refining		26.14	25.69
Iron and Steel		16.68	15.87
Rayon		29.41	29.60
Glass		21.61	21.44
Paint and varnish		27.10	24.54
Textiles		10.11	10.33
Coal products		11.39	11.23
Leather		3.62	3.98
Explosives		9.92	9.07
Rubber		6.52	6.25
Plastics		18.00	17.69

PRODUCTION



Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

IT'S UNION FOR MULTIWALLS

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

New Construction

Proposed Work

La., Avondale—American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., plans to construct a plant to recover nitrogen here. Estimated cost $47,750,000

La., Lake Charles—Cities Service Oil Co., Lake Charles, plans to construct a refinery to increase its daily capacity by 25,000 bbl. Estimated cost $26,650,000

La., Norco—Shell Oil Co., Richard Bldg., New Orleans, plans to construct a new catalytic refinery cracking unit, alkylation refinery unit, some modernization of existing refinery, steel storage tanks and product lines. Estimated cost $21,000,000, $7,000,000, $1,250,000 and $865,000 respectively

Mich., Montague—Hooker Electro Chemical Co., Niagara Falls, N. Y., plans to construct a plant for the manufacture of chlorine and caustic soda here. Estimated cost $7,000,000

Nev., Henderson—Hercules Powder Co., Delaware Trust Bldg., Wilmington, Del., plans to construct an insecticide plant here. Estimated cost $3,000,000

N. C., Spray—Union Carbide & Carbon Co., 30 East 42nd St., New York, N. Y., plans to construct a plant here. Estimated cost $33,000,000

O., Lima—Standard Oil Co., Midland Bldg., Cleveland, plans to construct a catalytic reforming unit and an addition to crude coking unit. Estimated cost $8,500,000 and $2,400,000 respectively.

Tex., Beaumont—E. I. du Pont de Nemours & Co., Inc., 2219 McKinney St., has purchased a 700 acre site here and plans to construct a plant for the manufacture of plastics and chemicals. Estimated cost $100,000,000

Tex., Matagorda—Ohio Oil Co., City Natl. Bank Bldg., Houston, plans to construct a propane and natural gas plant. Estimated cost $4,108,414

Tex., Stratford—Phillips Petroleum Co., Bartlesville, Okla., plans to construct a natural gas plant. Estimated cost $6,014,416

Tex., Sweeny—Phillips Petroleum Co., City Natl. Bank Bldg., Houston, plans to enlarge its existing refinery for the production of aromatics suitable in the production of aviation gasoline. Estimated cost $18,805,000

Contracts Awarded

Colo., Columbine (New Castle P. O.)—Columbine Development Co., Grand Junction, Colo., has awarded the contract for a bleached sulphate pulp plant to Ebasco Services, Inc., 2 Rector St., New York 16, N. Y. Estimated cost $15,846,000

Del., Frankford—Chandler & McCabe, Frankford, have awarded the contract for an addition to their fertilizer plant to William B. Dorey & Son, Millsboro, Del. Estimated cost $82,000

Ky., Calvert City—Pennsylvania Salt Co., Widener Bldg., Philadelphia, Pa., has awarded the contract for an addition to its plant for the manufacture of hydrofluric acid, sulphuric acid, chlorine and caustic soda to Leonard Construction Co., 375 Wabash Ave., Chicago, Ill. Estimated cost $8,000,000

Ky., Louisville—Kentucky Synthetic Rubber Corp., c/o Kaighin & Hughes, Inc., 125 South Huron St., Toledo, O., contractor, will construct additions to its plant here. Estimated cost $1,300,000

La., Lake Charles—Continental Oil Co., Lake Charles, has awarded the contract for a new platforming refining unit to Universal Oil Products Co., 310 South Michigan Ave., Chicago, Ill. Estimated cost $750,000

Mich., Detroit—Whitaker Paper Co., 5820 Nevada St., E., Detroit, has awarded the contract for a warehouse and office building to Campbell Construction Co., 9301 Michigan Ave. Estimated cost $380,000

Mich., Lansing—McKenzon & Robbins, Inc., Lansing, has awarded the contract for a warehouse to Reniger Construction Co., 127 North Cedar St., Lansing. Estimated cost $150,000

Minn., St. Paul Park—Northwestern Refining Co., St. Paul Park, has awarded the contract for a refinery addition to Procon, Inc. (Universal Oil Products Co.) 310 Michigan Ave., Chicago, Ill. Estimated cost $2,000,000

Mo., North Kansas City—Cook Paint & Varnish Co., 14th and Knox Sts. has awarded the contract for a warehouse and shipping building to Estrin Construction Co., 828 East 9th St., Kansas City. Estimated cost $250,000

Nev., Yerington—Anaconda Copper Mining Co., 25 Bway., New York, N. Y., will construct a zinc mining and sulphur plant. Work will be done by separate contracts. Estimated cost $33,000,000

N. Y., Syracuse—Bristol Laboratories, Thompson Rd., have awarded the contract for constructing chemical buildings 8-B and 8-C, to Conlon & Farnsworth, 912 State Tower Bldg. Estimated cost $200,000

Okla., Cushing—Deep Rock Oil Corp., Cushing, has awarded the contract for a lubricating oil refinery unit to M. W. Kellogg Co., Philtower Bldg., Tulsa. Estimated cost $2,225,000

S. C., North Charleston—Pittsburgh Metallurgical Co., North Charleston, will construct a plant addition. Work will be done with own forces. Estimated cost $150,000

Tenn., Chattanooga—Tennessee Products & Chemical Corp., Alton Park, will construct two electric furnaces. Work will be done by owner. Estimated cost $105,000

Tex., Big Spring—Cosden Petroleum Co., Big Spring, will construct a cracking plant unit. Work will be done by owners. Estimated cost $275,000

Tex., Houston—Shell Oil Co., Shell Bldg., has awarded the contract for a benzine plant to Foster Wheeler Corp., Shell Bldg.; platform refinery unit in connection with plant to Procon, Inc., (Universal Oil Products Co.) 310 South Michigan Ave., Chicago, Ill. Estimated cost $10,830,000 and $1,500,000 respectively.

Tex., LaPorte—Sinclair Refining Co., Gulf Bldg., Houston, has awarded the contract for a fluid catalytic cracking unit to C. F. Braun Co., 1000 South Fremont Ave., Alhambra, Calif.; crude distillation refinery unit to Fluor Corp., 2500 South Atlantic Blvd., Los Angeles, Calif. Estimated cost $8,775,000 and $1,750,000 respectively.

Tex., Midland—Magnolia Petroleum Co., Magnolia Bldg., Dallas, has awarded the contract for a gasoline plant to Hudson Engineering Corp., 2711 Danville St., Houston. Estimated cost $3,500,000

Tex., Midland—Tex Harvey Gasoline Co., Midland, will construct a gasoline plant. Work will be done with own forces. Estimated cost $4,750,000

Tex., Pasadena—Heyden Chemical Corp., 393 7th Ave., New York, N. Y., has awarded the contract for design and construction of a chemical plant to produce methanal and other products to Chemical Construction Corp., 488 Madison Ave., New York, N. Y. Estimated cost $12,000,000

Tex., Texas City—Pan-American Refining Co., Texas City, will enlarge the Pamarex unit at its chemical plant. Work will be done with own forces. Estimated cost $1,250,000

Tex., Waddell—Gulf Oil Corp., Gulf Bldg., Houston, will construct a 20 ton per day sulphur recovery unit. Work will be done with own forces. Estimated cost $685,000

Utah, North Salt Lake City—Western States Refining Co., North Salt Lake City, has awarded the contract for a Houdri flow catalytic cracking plant to Southwestern Engineering Co., 4900 South Santa Fe St., Los Angeles, Calif. Estimated cost $1,092,700

Wash., Mead—Kaiser Aluminum & Chemical Co., Oakland, Calif., will construct an industrial building and service extension, warehouse, storage building and other improvements. Work will be done by day labor. Estimated cost $1,285,000

	Current Projects		Cumulative 1951	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	$2,382,000	$12,546,000
Middle Atlantic	.....	$282,000	34,850,000	109,216,000
South	$137,515,000	10,305,000	429,005,000	430,789,000
Middle West	17,900,000	530,000	495,358,000	179,987,000
West of Mississippi	128,927,000	65,636,000	462,174,000	690,740,000
Far West	3,000,000	35,377,000	89,581,000	111,019,000
Canada	.....	.....	265,577,000	167,561,000
Total	$287,342,000	$112,130,000	$1,748,927,000	$1,617,858,000

You've heard of FLUOR QUALITY ...here's proof

You've only to look into a Fluor Counterflo Cooling Tower for the proof of quality—quality of design, of manufacture, of performance, and of appearance. The points illustrated below are just a few of the many features that have earned Fluor Towers their enviable reputation for quality—compare them when next you buy or specify.

GRID DECKS

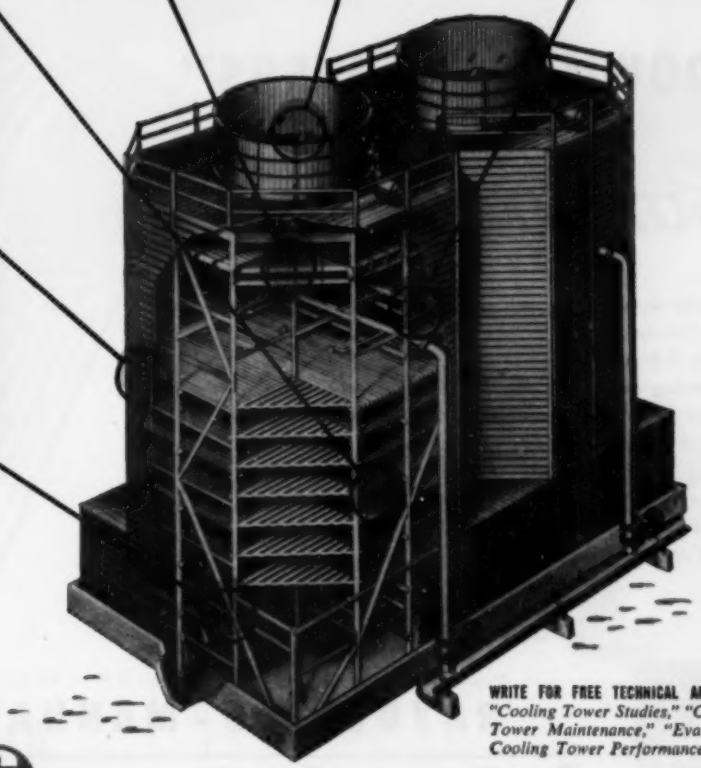
DRIFT ELIMINATORS

STACK and FAN ASSEMBLY

DISTRIBUTING SYSTEM

DOUBLE-WALL SHEATHING

TOWER STRUCTURE



WRITE FOR FREE TECHNICAL ARTICLES: *"Cooling Tower Studies," "Cooling Tower Maintenance," "Evaluating Cooling Tower Performance."*

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD., 2500 SOUTH ATLANTIC BOULEVARD, LOS ANGELES 22, CALIFORNIA
New York, Chicago, Boston, Pittsburgh, Tulsa, Houston, San Francisco, Birmingham, Calgary.
REPRESENTED IN THE STERLING AREAS BY: Head Wrightson Processes Ltd., Teesdale House, Baltic Street, London, E.C.I., England

"DOWNTIME-SAVERS"

Condor V-BELTS

You save downtime for belt take-up and belt replacement when you use Condor V-Belts. There are good reasons . . . Condor V-Belts are destretched and balanced by R/M engineering during manufacture . . . and they are made with straight sidewalls for more grip. As a result, each Condor V-Belt in a multiple drive pulls its share of the load without stretching, sagging or slipping. That's why, all Condor V-Belts run longer, save time and money • Bulletin 6868-E, "Grips the Grooves," describes other advantages of the "Smoothest Running V-Belts Made." Write for it, or call your R/M Distributor.

R M

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS - MANHATTAN, INC.

Flat Belts | V-Belts | Conveyor Belts | Hose | Roll Covering | Tank Lining | Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts Bowling Balls

CERTIFIED

SAFE

TOTALLY-ENCLOSED

AND EXPLOSION-PROOF

U.S. MOTORS

100% Safe... U. S. TOTALLY-ENCLOSED MOTORS

Without equal for dependability, this advanced line of motors insures safest power and longest life. The vital elements are given utmost protection against external hazards. The explosion-proof types are certified safe by Underwriters' Laboratories, Inc.

NORMALIZED CASTINGS

All castings normalized to remove internal stresses and maintain original symmetry of bearing settings and air gap between rotor and stator, assuring far longer bearing life.

HI-DRAFT VENTILATION

Ventilating fan is of non-sparking material for explosion-proof motors. Designed with split hub, permitting quick removal. Tight in operation. Multi-bladed for quietness.

LUBRIFLUSH BEARINGS

Self-lubricated for normal life—and with the extra advantage of Lubriflush, permitting relubrication when desired without disturbing the bearings. Fresh lubricant is injected; old grease is purged.

ASBESTOS-PROTECTED WINDINGS

Asbestos-protected windings withstand high temperatures and guard against carbonization. Each wire is insulated and isolated with asbestos, to protect against burn-outs & increase motor life.

SPLIT HUB FAN

The propulsion fan forces an air blast against lamination edges, dissipating the heat as fast as it generates—keeping the motor continuously cool. The air is drawn in through end grill.

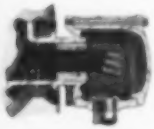
REMOVABLE COVER

The cover plate can be quickly removed by loosening screws for inspection and to eliminate deposits of dust, dirt, lint, etc. and all other accumulations.

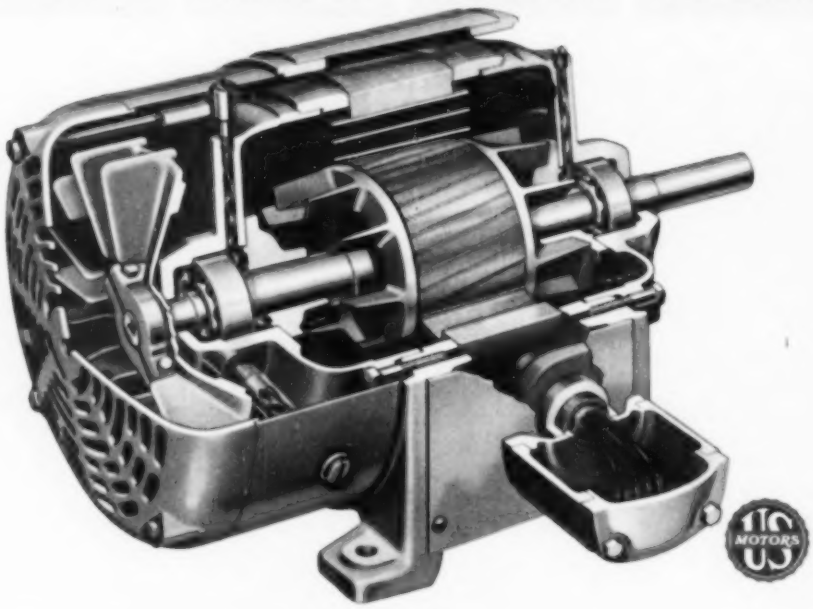
CENTRICAST ROTOR

Centrifugally cast from molten aluminum into a solid, indestructible structure, free of defects.

SEALED TERMINAL



Extra large chamber is sealed with special compound, very high in dielectric strength and with a high melting point.



SMOOTH GRILLE

For protection of the fan and to prevent entrance of debris, an end grille is provided, smoothly contoured.

CERTIFIED SAFE FOR HAZARDOUS SERVICES

U. S. Totally-Enclosed Motors carry the official Underwriters' label for explosion-proof services in Class I, Group D, for highly inflammable gases and volatile liquids, and Class II, Groups F and G for combustible dusts. These motors are also available for non-explosion-proof services such as chemicals, dust and moisture, without label, and with or without fan —Horizontal, Vertical and Varidrive types. New Bulletin gives full details.

U. S. Electrical Motors Inc. CE
Box 3058, Los Angeles 54, Calif.
or Milford, Conn.

Send your new Bulletin illustrating and describing U. S. Totally-Enclosed Motors. ☐ Also General Bulletin of all U. S. Motors. ☐

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE___ STATE_____

U.S. ELECTRICAL MOTORS Inc.

PACIFIC PLANT: Los Angeles 54, Calif. (P.O. Box 3058) ATLANTIC PLANT: Milford, Conn.
Atlanta 3, Ga. · Bakersfield, Calif. · Boston 16, Mass. · Chicago 9, Ill. · Cincinnati 16, Ohio · Cleveland 14, Ohio · Dallas 9, Texas · Detroit 2, Mich. · Fresno 1, Calif. · Houston 4, Texas · Indianapolis 4, Ind. · Milwaukee 2, Wisc. · Minneapolis 2, Minn. · New York City 6, N. Y. · Philadelphia 2, Pa. · Pittsburgh 2, Pa. · San Francisco 7, Calif. · Seattle 4, Wash.
Sales and Service offices in all principal cities

HEAT RESISTANT SIGHT GLASSES

GLASS CUT AND GROUND TO YOUR SPECIFICATIONS

Standard Thicknesses and Finishes

THICKNESS	EDGE FINISH
$\frac{1}{8}" \pm \frac{3}{64}"$	Cut or ground
$\frac{3}{16}" \pm \frac{1}{32}"$	Cut or ground
$\frac{1}{4}" \pm \frac{1}{32}"$	Cut or ground
$\frac{3}{8}" \pm \frac{1}{16}"$	Cut or ground
$\frac{1}{2}" \pm \frac{1}{16}"$	Ground edges only
$\frac{5}{8}" \pm \frac{1}{16}"$	Ground edges only
$\frac{3}{4}" \pm \frac{1}{16}"$	Ground edges only
$1" \pm \frac{3}{32}"$	Ground edges only

NOTE: PYREX brand plate glass is made at the factory in 24", ±0 −4", wide strips, and widths over 20" are not always immediately available. Write, wire or phone for quotations, giving complete specifications of size and shape required. Your order will be given immediate attention.

PYREX Brand Plate Glass Blue Viewing Glass
Available for prompt delivery from:

SWIFT LUBRICATOR CO.
Elmira Heights, N. Y.

F. J. GRAY CO.
182 S. Portland Avenue, Brooklyn 2, N. Y.

FRED S. HICKEY, INC.
5041 West Lake Street, Chicago 44, Ill.

CINCINNATI GASKET & PACKING CO.
1507-09-11 Elm St., Cincinnati 10, Ohio

STEMMERICH SUPPLY, INC.
730 So. Broadway, St. Louis 2, Missouri

AMERICAN PACKING & GASKET CO., LTD.
115 Austin St., P. O. Box 213
Houston 1, Texas

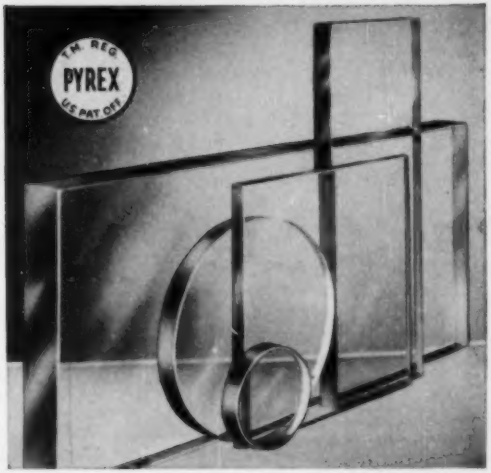
HOWE-MARTZ GLASS CO.
930 Monroe Street, Detroit, Michigan

MACALASTER BICKNELL CO.
243 Broadway at Windsor St.
Cambridge 39, Massachusetts

EAST BAY GLASS CO.
621 Sixth Street, Oakland, California

W. P. FULLER CO.
Fairview Ave. N. & Roy St., Seattle, Wash.
222 North Ave., 23rd, Los Angeles, Calif.
Portland, Oregon

HOBBS GLASS LTD.
690 St. James Street West
Montreal, Quebec, Canada



Good visibility under corrosive conditions and high temperature is the answer to your sight glass problem. For over a quarter of a century, PYREX brand glass No. 7740 has been serving industry with these same properties.

PYREX brand polished plate glass, finished in a wide variety of sizes and shapes, stands up under extremely rugged service in ovens, reaction kettles, stills, columns, pressure vessels, processing tanks, furnaces, evaporators and other equipment throughout industry—wherever heat resistance and visibility are required in a plant operation.

You may use PYREX brand sight glasses where high temperature or sudden temperature changes are encountered. No acids (except hydrofluoric and crude phosphoric) will attack this glass. Corrosion may be experienced with highly concentrated, hot caustic solutions, but this difficulty can be overcome by periodic replacements.

Not only will PYREX brand polished plate glass give you the best of service once installed, but it is available in a wide variety of sizes to fit your equipment.

Obtainable sizes are limited only by the maximum sheet size, 24" by 60". The table at left lists available thicknesses.

CORNING GLASS WORKS
CORNING, NEW YORK
Corning means research in Glass
VISIT THE CORNING GLASS CENTER

CORNING GLASS WORKS, Dept. CE-1, Corning, N.Y.
Please send Bulletin describing PYREX brand heat-resistant sight glasses.

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

GARLOCK PACKINGS and GASKETS

made of *Teflon**

Extremely Inert to Chemicals: Heat Resistant: Tough: Durable

GARLOCK packings and gaskets made of *Teflon* solve the problem of sealing against acids and chemicals of all kinds.

These *Teflon* products, fabricated in the GARLOCK factories, are unaffected by any acid and are highly resistant to all organic solvents and alkalies. They operate at temperatures from below −90° F. up to +500° F. and have high mechanical strength and a low coefficient of friction within that temperature range.

For use on valves, pump rods or shafts and any other equipment in the chemical industry, GARLOCK produces several types of braided and molded *Teflon* packings. For gasketing flanged joints of all kinds, including glass and porcelain flanges, *Teflon* envelope gaskets or solid *Teflon* gaskets are available in required sizes and shapes.

To avoid frequent shut-downs and reduce your packing costs, use GARLOCK packings and gaskets made of *Teflon* on all your equipment handling acids or chemicals. *Write for pamphlet.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

WHERE you get it...

DOES make a difference

When you place your order with Barrett you're assured prompt, dependable service and top quality products, backed by 97 years of successful manufacturing experience.

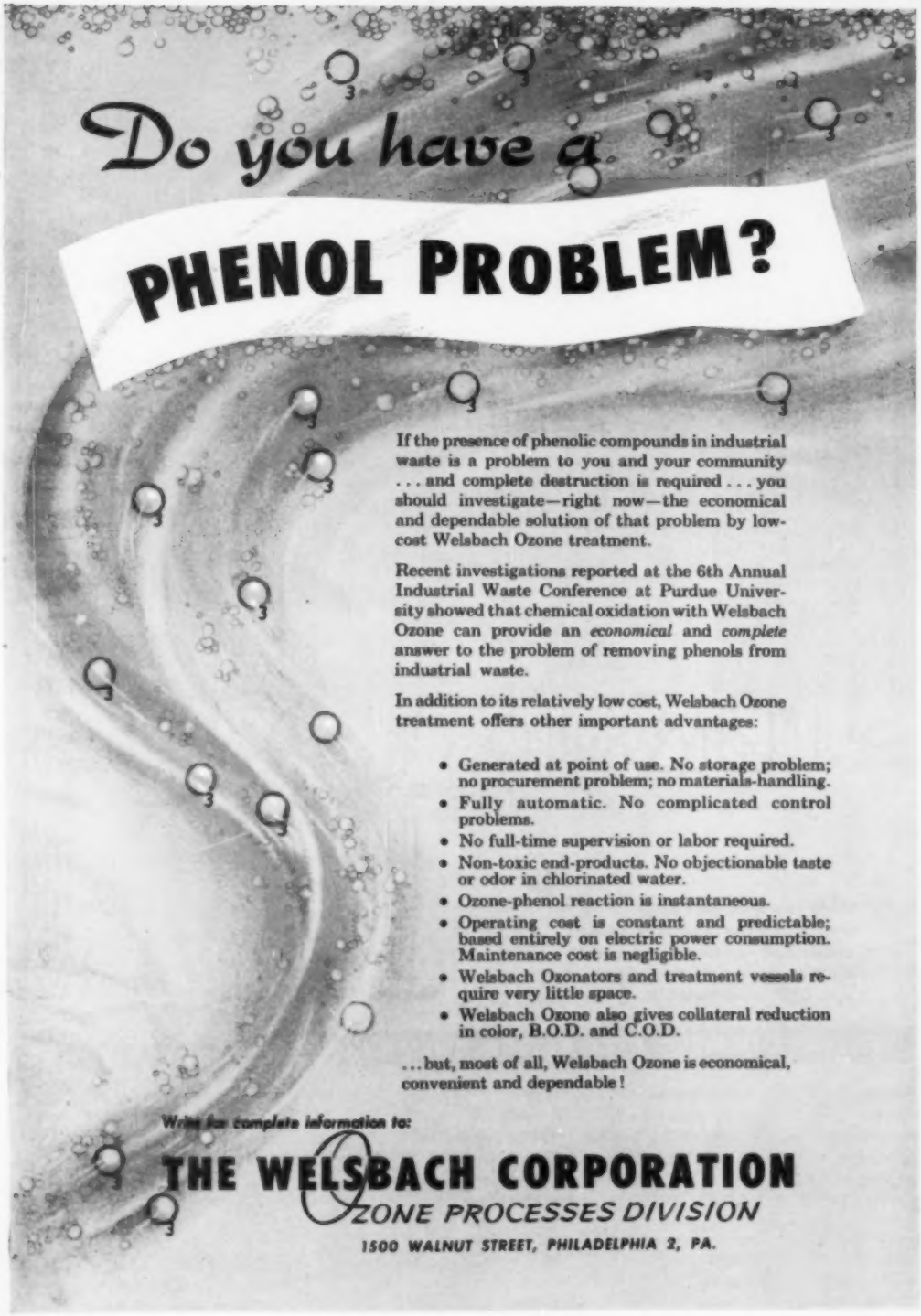
WHEN YOU NEED A COAL-TAR CHEMICAL – GET IT FROM...

Phenols	Phthalic Anhydride	Lutidines
Cresols	Dibutyl Phthalate	Tar Acid Oils
Cresylic Acids	ELASTEX* DCHP Plasticizer	Neutral Coal-tar Oils
Chlorinated Tar Acids	"ELASTEX" 10-P Plasticizer	Coal-tar Creosote
Xylenols	"ELASTEX" 50-B* Plasticizer	CUMAR* Paracoumarone-Indene Resin
Pickling Inhibitors	"ELASTEX" 28-P Plasticizer	Carbonex* Rubber Compounding Hydrocarbon
Benzol	Phenolic Resins	Bardol* Rubber Compounding Oil
Toluol	Niacin (Nicotinic Acid)	Flotation Agents
Xylol	Pyridines	
Naphthalene	Picolines	
Hi-Flash Solvent	Quinoline	

Barrett®

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Reg. U. S. Pat. Off.



If the presence of phenolic compounds in industrial waste is a problem to you and your community . . . and complete destruction is required . . . you should investigate—right now—the economical and dependable solution of that problem by low-cost Welsbach Ozone treatment.

Recent investigations reported at the 6th Annual Industrial Waste Conference at Purdue University showed that chemical oxidation with Welsbach Ozone can provide an *economical* and *complete* answer to the problem of removing phenols from industrial waste.

In addition to its relatively low cost, Welsbach Ozone treatment offers other important advantages:

- Generated at point of use. No storage problem; no procurement problem; no materials-handling.
- Fully automatic. No complicated control problems.
- No full-time supervision or labor required.
- Non-toxic end-products. No objectionable taste or odor in chlorinated water.
- Ozone-phenol reaction is instantaneous.
- Operating cost is constant and predictable; based entirely on electric power consumption. Maintenance cost is negligible.
- Welsbach Ozonators and treatment vessels require very little space.
- Welsbach Ozone also gives collateral reduction in color, B.O.D. and C.O.D.

. . . but, most of all, Welsbach Ozone is economical, convenient and dependable!

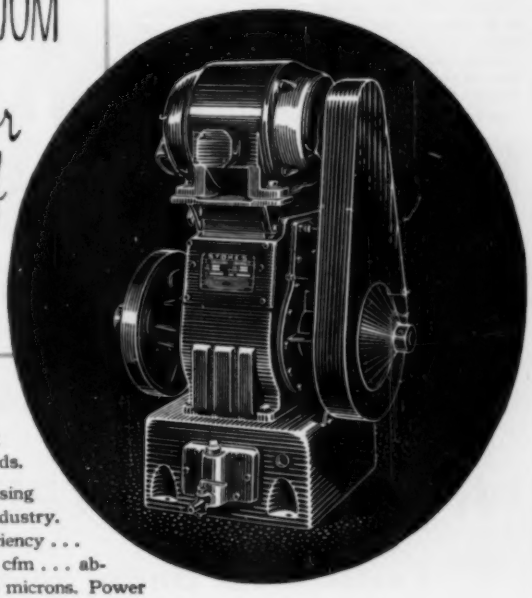
Write for complete information to:

THE WELSBACH CORPORATION

OZONE PROCESSES DIVISION

1500 WALNUT STREET, PHILADELPHIA 2, PA.

STOKES HIGH VACUUM EQUIPMENT... for every requirement of vacuum processing



Modern design of Stokes vacuum equipment develops from the continuing contact of Stokes Engineers with processors in many fields.

Stokes Microvac Pumps -- basic to vacuum processing —are designed for the broadest requirements of industry. They have high volumetric and mechanical efficiency . . . capacities of 15 to 500 cfm . . . absolute pressures to 10 microns. Power consumption is low. Compact design with top-mounted motor requires minimum floor space.

There are but four moving parts including the high-speed, full-opening exhaust valve of corrosion-resistant Teflon. Lubrication is completely automatic, without packing, stuffing-boxes or grease fittings. Wear is kept to a minimum, and long trouble-free service assured. Parts are precision-finished, standard and interchangeable.

Send for FREE Stokes Vacuum Calculator. This slide rule determines needed pump capacity for any job...shows Centigrade to Fahrenheit conversion. Other useful conversion tables and scales on reverse of rule.

Stokes is the only manufacturer of equipment for complete vacuum systems, including Microvac mechanical pumps, oil diffusion pumps, McLeod Gages and Vacuum Valves.

Consult with Stokes on the application of vacuum to drying, freeze-drying, impregnating, extraction, solvent recovery, distilling, evaporating, vacuum metallizing, and to other applications in which vacuum deserves exploration.

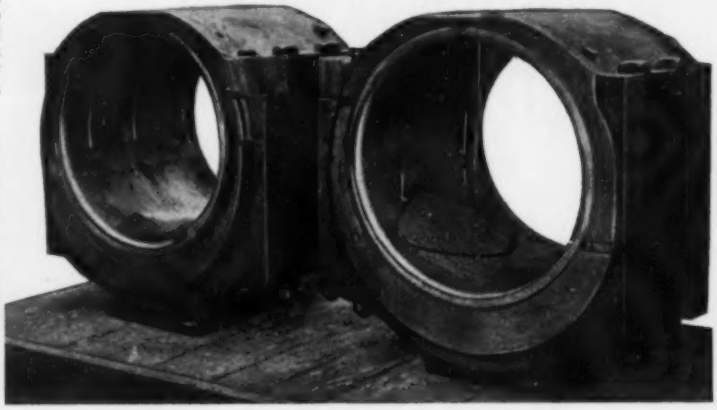
STOKES MAKES
Plastics Molding Presses,
Industrial Tableting
and Powder Metal Presses,
Pharmaceutical Equipment,
Vacuum Processing Equipment,
High Vacuum Pumps and Gages,
Special Machinery

STOKES

F. J. STOKES MACHINE COMPANY, 5500 TABOR ROAD, PHILADELPHIA 20, PA.

THIS PROPANE-BUTANE PUMP GEAR is cast in Olds 5% nickel bronze to assure excellent wearing qualities, since oil and grease fail to lubricate when in contact with such strong solvents as propane or butane. These pump gears (1¾" to 2½" O.D.) and sleeve bushings, of Olds high leaded nickel bronze, are used by Smith Precision Products Co., South Pasadena, Calif.

ON THESE SURFACES OF OLDS BEARING BRONZE ... a 19" journal, with .045" clearance, turned at 20½ R.P.M. for almost 9 years in a 4-roll calendar mill used in processing cord and rubber fabric for automobile tires.



NICKEL ALLOYED BRONZES

Resist Wear Under Severe Operating Conditions

These large bearings served continuously for nearly nine years at temperatures ranging from 80 to 120° F.

They are made of a high lead nickel-tin bronze, trade-named Olds Bearing Bronze, developed some 15 years ago by the Olds Alloy Company of South Gate, California.

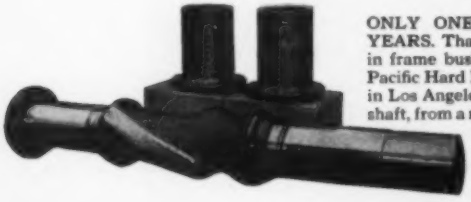
Containing about 18% lead, 5% nickel, 5% tin and 10% zinc (balance copper), this wear-resistant alloy was approved by a leading aircraft manufacturer, early in World War II, for friction bearings operating without galling, under conditions of little or no lubrication.

Although high lead content in bronze alloys improves bearing properties, it lowers strength. However, an adequate nickel content provides age-hardening response which increases both tensile and compressive strength.

Furthermore, nickel tends to diffuse lead in the alloy, refines the grain, and increases resistance to corrosion and erosion.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to appropriate authorities, nickel is obtainable for the production of nickel alloyed bronzes for many end uses in defense and defense supporting industries.

If interested, we shall be glad to put you in touch with the foundry equipped to quote on your requirements.



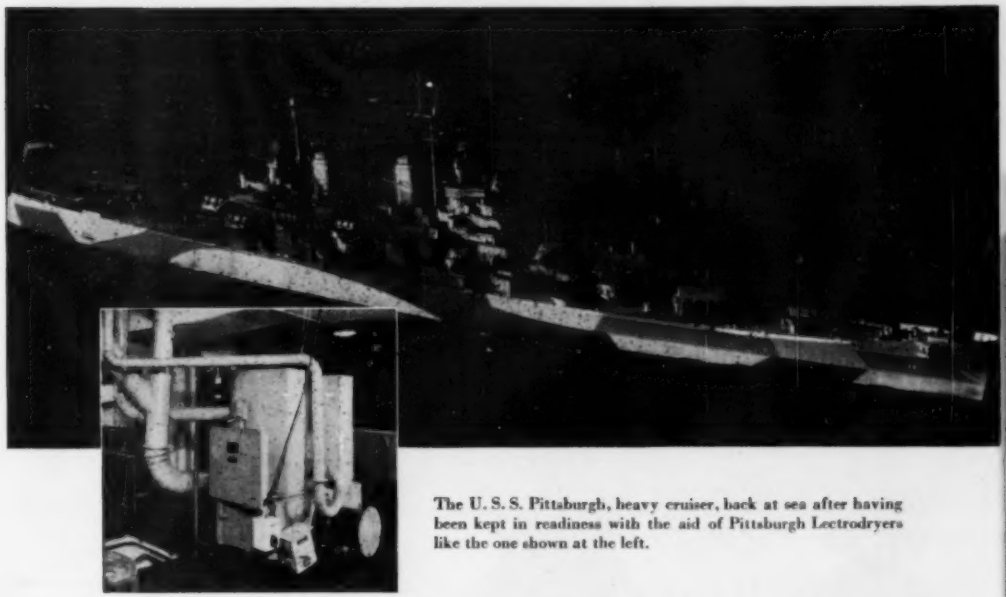
ONLY ONE SET OF REPLACEMENTS IN 13 YEARS. That's how Olds Bearing Bronze economizes in frame bushings and thrust rings on mullers at the Pacific Hard Rubber Division of Stauffer Chemical Co., in Los Angeles. The two bushings shown with the steel shaft, from a muller, are typical of nickel-alloyed bronze parts that minimize galling and heatings despite the abrasive material handled in battery case manufacture.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Suppose YOU

had to "warehouse" a 13,000-ton cruiser . . .



The U. S. S. Pittsburgh, heavy cruiser, back at sea after having been kept in readiness with the aid of Pittsburgh Lectrodryers like the one shown at the left.

The Navy did it by making the ship its own warehouse. In "Operation Mothball" the hull was sealed tight against outside moisture and the relative humidity maintained below 30% with the aid of Lectrodryers*. Now "Operation Zipper" has put the Pittsburgh back in service, its vitals rust-free and corrosion-free.

To warehouse safely any goods that WETth (unwanted moisture) would spoil—depend upon Lectrodryer. A Lectrodryer will DRY your storage-space air continuously, economically, automatically. Lectrodryer* engineers will work with you to design your entire DRYing operation—including selection and installation of moisture-vapor barriers to control atmospheric WETth. Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U. S. PAT. OFF.

Get this Straight!

Powell has always kept pace with every development in the Chemicals and Process Industries. As new demands arise, Powell Engineers will design valves to satisfy them.

Shown here are a few of the many Powell Valves made in the widest selection of corrosion-resisting materials ever offered to these industries.

The Wm. Powell Co.
Cincinnati 22, Ohio

Fig. 1861—200-pound Stainless Steel Globe Valve with screwed ends, union bonnet, inside screw stem and plug type disc. Available in a variety of other corrosion-resisting metals and alloys.

Fig. 2433 S.S.—Large size 150-pound Stainless Steel Swing Check Valve with flanged ends. All dimensions conform to latest standards. Available in other corrosion-resisting metals and alloys, with body-cap bolts and nuts in Stainless Steel. Also with screwed ends.

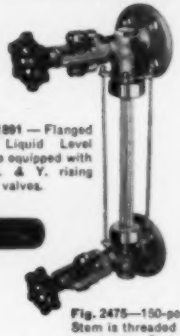


Fig. 1891—Flanged End Liquid Level Gauge equipped with O. S. & Y. rising stem valves.

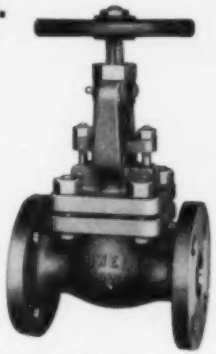
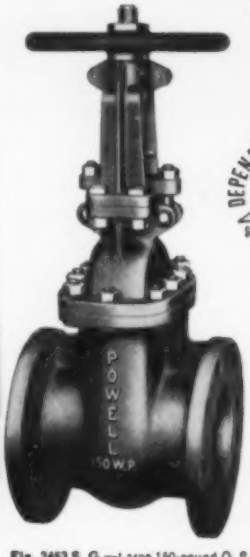


Fig. 2475—150-pound, flanged end, O. S. & Y. Globe Valve. Stem is threaded and guided through a bushing screwed into upper yoke. Seat and plug type disc can be easily reground if necessary. Conforms to all latest standards. Available in a large selection of corrosion-resisting metals and alloys with bolts and nuts in stainless steel. Also with screwed ends.



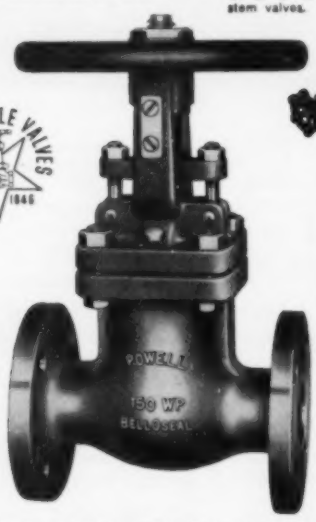


Fig. 2453 S. G.—Large 150-pound O. S. & Y. Stainless Steel Gate Valve with precision-fitted, accurately guided solid wedge. Can also be furnished with split wedge. Made in sizes 5" to 30", incl., with separable yoke arms. This valve conforms to all the latest standards. Available in a wide selection of other corrosion-resisting metals and alloys.

Bell-O-Seal Globe Valve. Designed to handle hazardous fluids; for high vacuum service; or for use where a packless valve is needed. Available in Globe, Angle and "Y" patterns, with screwed, flanged or welding ends. Made in a wide variety of corrosion-resisting metals and alloys, in sizes from ¼" to 12", inclusive.

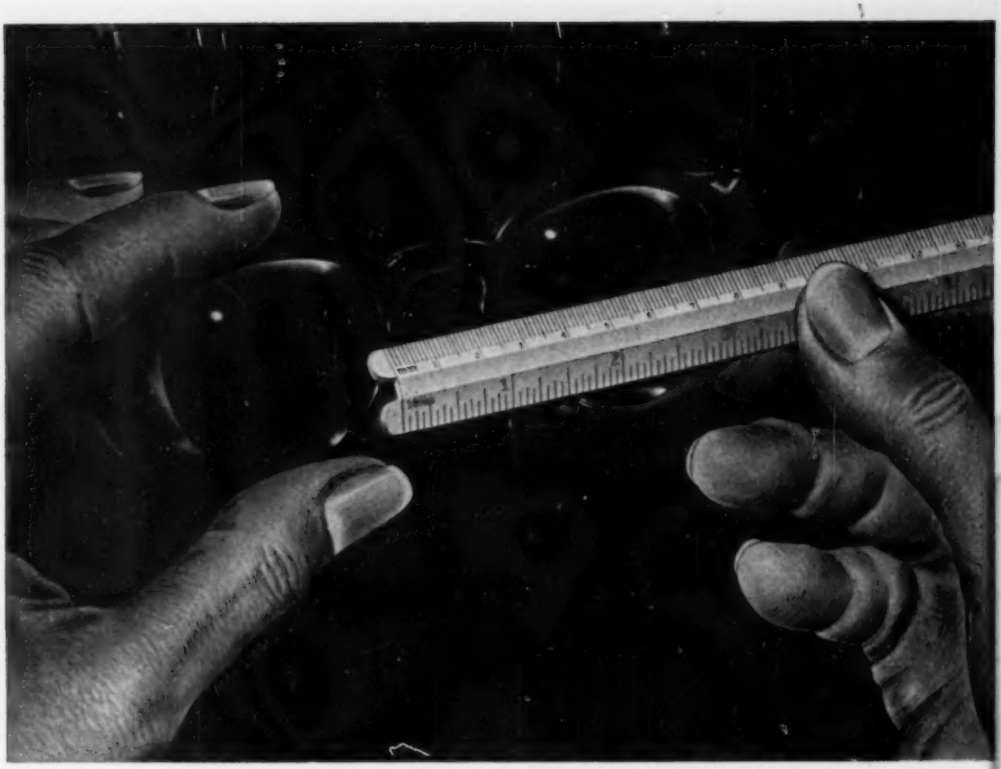
POWELL VALVES for CORROSION-RESISTANCE are available in the following metals and alloys

Stainless Alloys	Nickel and Nickel Alloys	Bronzes—Acid, Aluminum, Silicon
18-8S	Nickel	Everdur
18-8S Mo.	Monel Metal*	Herculoy
18-8S Cb.	Inconel*	Ampco
Misco "C"	Hastelloy Alloys†	Ampcoloy
Durimet 20	(A, B, C and D)	76
11.5-13.5% Cr. Iron	Illium	90-10
18% Cr. Iron	D-10	88-10-2
28% Cr. Iron		
25% Cr. 12% Ni.		
Alloy Steels	**Cast Irons**	**Aluminum**
Carbon Steel	Cast Iron	Alcoa No. 43
4-6% Cr. .5% Mo.	3% Nickel Iron	Alcoa No. B-214
3.5% Nickel Steel	Ni-resist*	Alcoa No. 61 S-T
6-8% Cr. .5-.75% Mo.	**Hard Lead**	**Molybdenum**
8-10% Cr. 1.1-1.5% Mo.		**Silver**

*Registered trade-names of the International Nickel Co., Inc.
†A registered trade-name of the Haynes-Stellite Co.

POWELL VALVES

In Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys.



Optician's Rule made by Sadler Brothers, Inc., S. Attleboro, Massachusetts

A new measure of dimensional stability

How would you like to see *all* these qualities in *your* product?

Die shrinkage so low you can mold accurate measurements right into your product!

Real dimensional stability that keeps it the way it was made—no warping, swelling, or shrinking!

Toughness and rigidity that make it stand up under the hardest use!

The makers of this optician's rule wanted all these qualities—and got them with **NAUGATUCK CHEMICAL'S KRALASTIC D-IVORY!** This unusual styrene copolymer not only measured up—it gave important bonuses!

It had high chemical stability and resistance to moisture. **And its smooth surface licked the once serious problem of rejects—made it easy to fill in line work without danger of smearing!**

All at reduced production costs!

It's just one more case of a manufacturer profiting from Naugatuck Chemical's ingenuity and fine basic materials. It may suggest the role Naugatuck Chemical can play for you, in improving an old product, helping to create a new one. Why not look into it? Send us the coupon below.

Naugatuck Chemical

Division of **UNITED STATES RUBBER COMPANY**
NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York
Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario

Naugatuck Chemical Plastics Division, Elm St., 71
Naugatuck, Conn.

Without charge, send technical data on properties, uses, handling methods (specify desired and products).

I understand that, from this data, I can order suitable, free experimental samples.

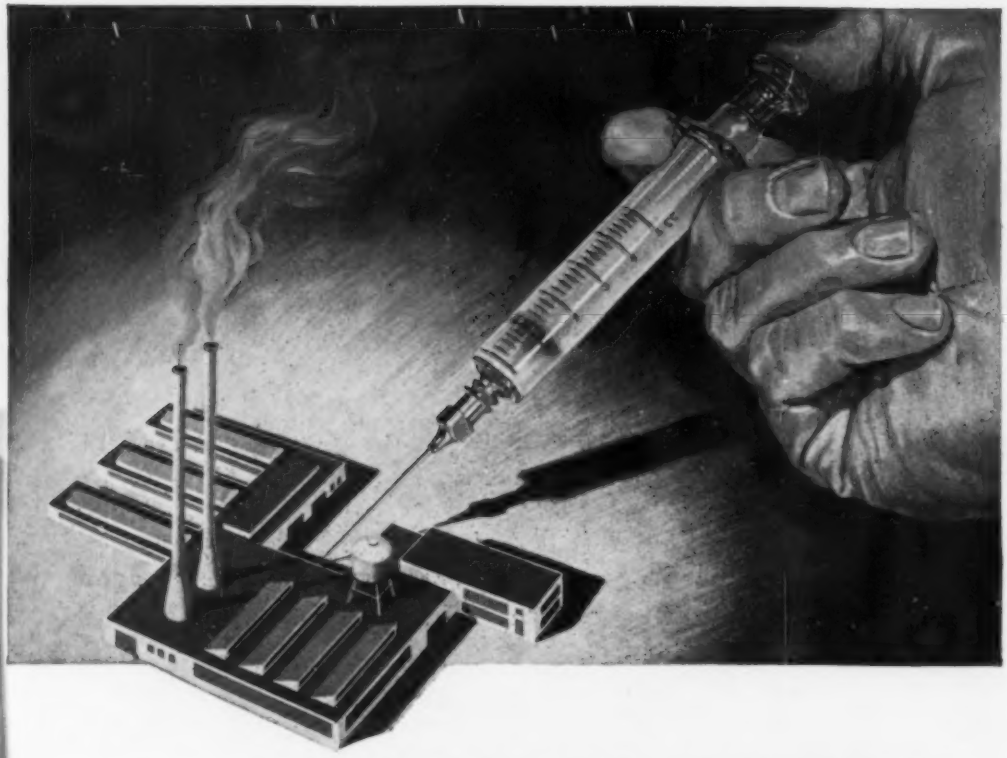
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MARVINOL® vinyl resins • KRALASTIC® styrene copolymers • VIBRIN® polyester resins
Rubber Chemicals • Aromatics • Synthetic Rubber • Agricultural Chemicals • Reclaimed Rubber • Latices



Vitamins That Make Production Grow

Perhaps, like many producers these days, you've found today's heavier demands are asking more from your equipment than it can produce.

Consider how one typical company injected new productivity into *its* operation:

This was a soap processor who needed extra production and new fuel economy for a process involving crude with a high salt content. Development of a specially-built still pot of economical clad steel eliminated need of multiple distillation . . . reduced fuel and maintenance . . . speeded up heating . . . ended corrosion . . . provided structural strength to withstand vacuum—*and cut first equipment cost, too.*

What makes this story significant is that it resulted from a progressive planning method followed by certain Equipment Builders.

These specialists bring leading engineers, designers, and materials suppliers into the planning of your equipment. Each factor affecting performance *is thought out by a specialist in that field.* And in such planning, you'll find these builders turning to Lukens for its knowledge of materials, as well as its wide range of low-cost clad steels.

Even with new equipment often difficult to get these days, we know builders who can recondition what you have for better performance, better profits. Write us today, explaining your need. Manager, Marketing Service, 400 Lukens Building, Coatesville, Pennsylvania.

LUKENS

LUKENS STEEL COMPANY

WORLD'S LEADING PRODUCER OF SPECIALTY PLATE • PLATE SHAPES • HEADS • CLAD STEELS

New NIAGARA FILTER speeds up filtration when solids % is high!

Cake is discharged in semi-dry condition by tapping leaves with rubber mallet. Air-blown cakes separate readily from all-metal leaves. All leaves are exposed as a unit for fast, easy cleaning.

Cuts cleaning time to *minutes!* Boosts filter capacity 2 *to* 3 *times* in same floor space!

This new Niagara Style H* Filter does the work of several conventional filter presses of equivalent area.

PRODUCES UP TO 3 TIMES THE OUTPUT OF CONVENTIONAL PRESSES. With high solids capacity (up to 150 cu. ft. per unit) this new filter gives you production rates 2 or 3 times as fast as cloth-covered presses. One man operating several Style-H Filters produces as much as two or three men on conventional presses.

ENDS CLOTH REPLACEMENT AND WASHING. All-metal filter leaves proved in use in Niagara vertical filters completely eliminate press cloths. You save entirely the costs of cloth washing, handling and replacement.

CUTS CLEANING TIME TO MINUTES. One operator easily discharges up to 150 cu. ft. of filter cake in minutes, not hours. Filter leaves roll out as a unit, are easily accessible. Cakes are discharged quickly in semi-dry state ready for immediate disposal or recovery.

The Q/O* (quick-opening) cover of this new filter locks and unlocks with one fast, easy motion. No hand wheels, eyebolts, spokes or spiders . . . even a girl can operate it.

EXTRA ADVANTAGES INCLUDE—Flow rates to 1000 GPM per unit . . . All-welded leak proof construction—safe for handling volatile, flammable, explosive materials . . . Easily steam jacketed . . . Excellent cake washing characteristics . . . Sharpest filtrate clarity—approaching zero turbidity . . . Interchangeable leaves.

*Trade Mark Pat. Applied for.

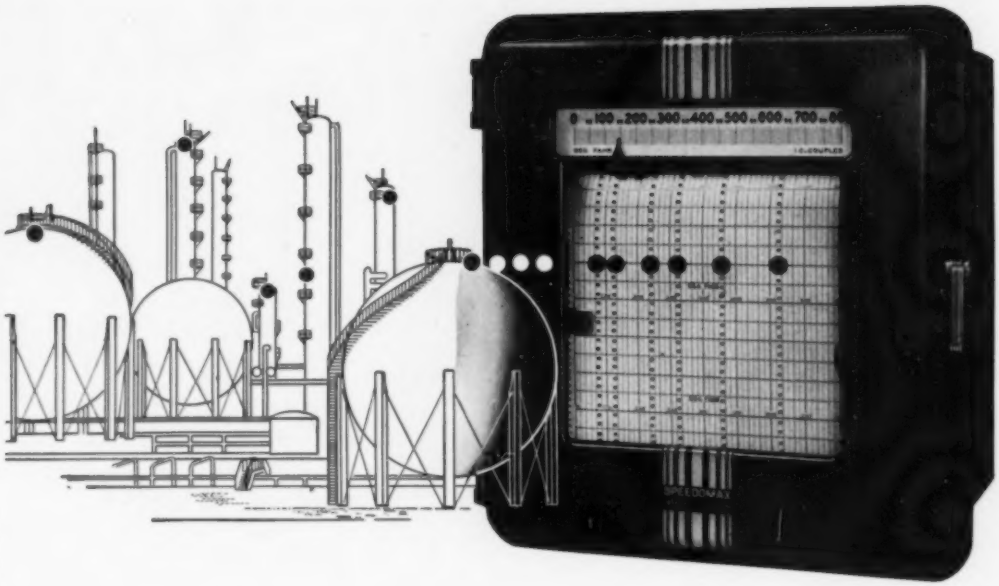
For more facts—mail the coupon or write us today.

Niagara Filter CORPORATION

IN EUROPE—NIAGARA FILTERS EUROPE, 36 Leidsegracht, Amsterdam-C, Holland

NIAGARA FILTER CORP., 3007 Main St., Buffalo 14, N.Y.
Please send me Bulletin H-1051 on the Style H Filter.

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State____



A new temperature Fact every 2 sec!

Today, when many refinery operations may need temperature facts within seconds instead of minutes, the Speedomax story is worth knowing:

For a Speedomax Multiple-point instrument's record-printing "wheel" darts from temperature to temperature in just 2 seconds per point! Thus, if there are, say, 15 fairly important temperatures on a single refinery unit, each one can actually come up and be recorded as often as twice per minute, automatically and continuously.

Two extra checks for vital temps

But suppose a few points require even closer watching, or more frequent recording? Speedomax handles them, too, in either of two ways:

First, they can be recorded more frequently than the other points, in such a sequence as 1, 2, 1, 3, 1, 4, etc.

Second, the vital points can be recorded in greater detail than the other points. This is done by giving the instrument an additional range which is used only with the pre-selected points. This range puts far fewer degrees-per-inch across the instrument's scale; it thus "spreads" the reading for detail.

Ability to measure temperature from any source and across either wide ranges or the new narrow ranges is another L&N specialty. Selection among thermocouples, Thermohms and Rayotubes will determine the correct sensing element. Selection among various recorder components will put the information on paper in the desired form.

160 temps on one instrument

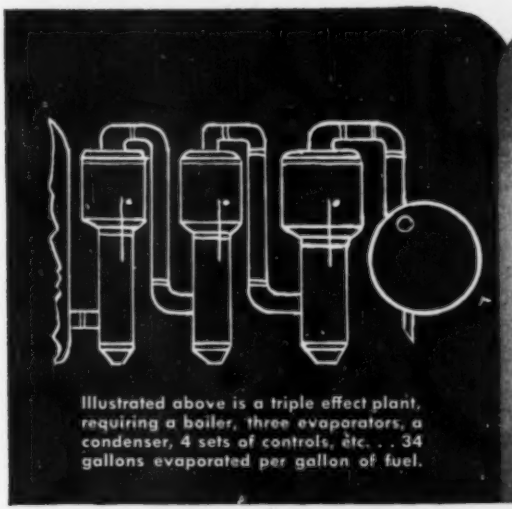
For these and many more features . . . for instance, 160-point models . . . credit Speedomax's refined, stable, dependable construction, both electrical and mechanical. Too, Speedomax is not affected by vibration; never needs levelling up; can measure many quantities besides temperature.

Any L&N office, including 4916 Stenton Ave., Phila. 44, Pa., will send the Speedomax story on request.

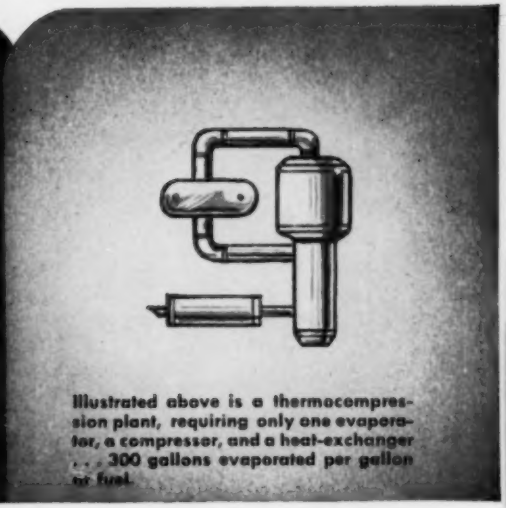
LEEDS NORTHRUP

Jrl. Ad. ND46-700(2)

The difference between Night and Day



Illustrated above is a triple effect plant, requiring a boiler, three evaporators, a condenser, 4 sets of controls, etc. . . 34 gallons evaporated per gallon of fuel.



Illustrated above is a thermocompression plant, requiring only one evaporator, a compresser, and a heat-exchanger . . . 300 gallons evaporated per gallon of fuel.

with MECO THERMOCOMPRESSION EVAPORATORS

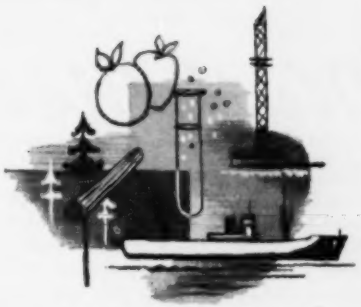
lower cost — much greater efficiency!

LOWER FUEL COST

No matter what the job is—evaporation for concentration or distilled water production—you will find that MECO thermocompression evaporators do the job better at less cost! For instance, one MECO unit is equivalent in efficiency to a *27 effect*, multiple effect conventional plant . . . can make *pyrogen free*, chemically pure water.

LOWER OPERATION & MAINTENANCE COST

The higher the efficiency, the fewer the components, the more simple in principle the machine is—the less the cost of operation! Our brochure will describe principles of MECO thermocompression evaporation and the reasons why it will keep the operating cost of your job down, way down! MECO's working parts are so few and so easy to keep up that an average mechanic can do it with ease. High quality design insures long life.



Sea water for distillation for the oil industry . . . Concentration for the Chemical industry . . . uses in the paper, fruit juice and many other industries.

MECO

MECHANICAL EQUIPMENT CO., INC.

NEW ORLEANS, LOUISIANA

This equipment is built under various patents belonging to Mechanical Equipment Company, and Arthur D. Little, Inc.

MECHANICAL EQUIPMENT CO., Inc.
861 Carondelet St.
New Orleans, La.

Please send me bulletin concerning MECO thermocompression evaporation units.

Name _____

Address _____

It's the Nash!

The ability of Nash Compressors to maintain original performance over long periods is no accident. Nash Compressors have but a single moving element, the Nash Rotor. This rotor is precision balanced for long bearing life, and it revolves in the pump casing without metallic contact. Internal lubrication, frequent cause of gas contamination, is not employed in a Nash. Yet, these simple pumps maintain 75 lbs. pressure in a single stage, and afford capacities to 6 million cu. ft. per day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or other enemies of long life. Compression is secured by an entirely different principle of operation, which offers important advantages often the answer to gas handling problems difficult with ordinary equipment.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. Because there are no internal wearing parts, maintenance is low. Service is assured by a nation-wide network of Engineering Service offices. Write for bulletins now.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

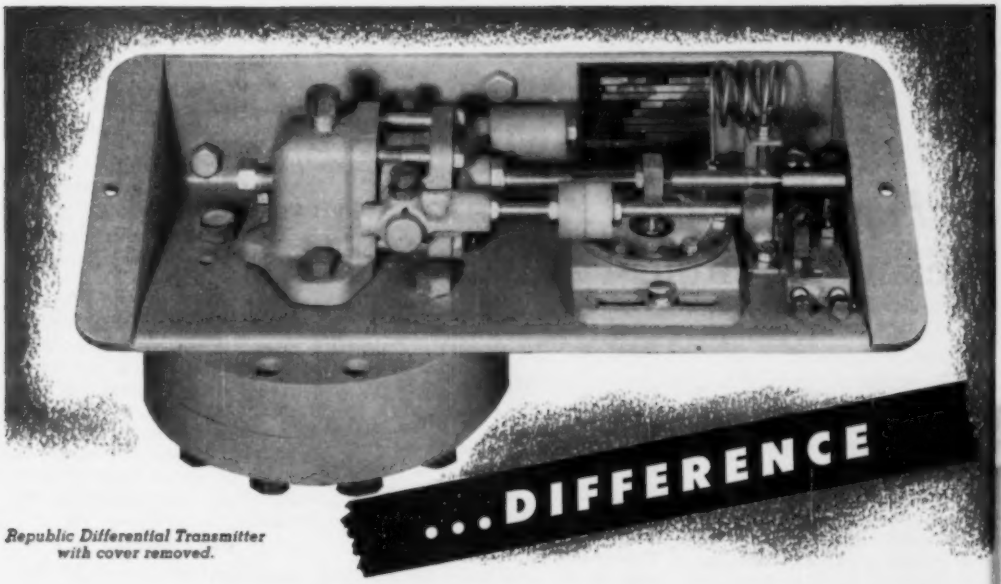
Desired delivery temperature Automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

312 WILSON, SO. NORWALK, CONN.



Republic Differential Transmitter with cover removed.

Spells *PLUS* PERFORMANCE

The Republic Pneumatic Transmitter combines machine ruggedness with instrument precision to provide matchless performance in measuring flow, level, pressure or density of a wide variety fluids. By any or all of the following points, the Republic challenges comparison:

ACCURACY of the Republic force-balance principle is higher than can be consistently secured and maintained with any other method. 1/2 of 1% guaranteed.

TEMPERATURE variations of ambient atmosphere have negligible effect on the accuracy of the Republic transmitter.

CHANGES IN AIR SUPPLY PRESSURE do not affect the accuracy of a Republic transmitter to any significant extent. A 5 psi change produces an error of less than 1/10%.

CHANGES IN LINE PRESSURE—Republic differential transmitters are not affected by variations in line pressure. A patented and exclusive simple adjustment assures this protection.

SENSITIVITY—Due to the negligible motions required for complete operation of all parts, for a full scale change, no appreciable hysteresis results from reversal of direction of measurement change.

VIBRATION of any normal frequency has no effect on the Republic transmitter.

LEVELING—Since all parts are balanced, and no liquid is used for calibration, Republic transmitters need not be leveled exactly, and may be adjusted for installation in any position.

FOR TWELVE YEARS Republic Pneumatic Transmitters have delivered unmatched performance in every type of installation. Complete details of design and operation, plus numerous application suggestions are combined in Data Book, 1002. Send for your copy, today.

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois

Amazing Properties of New Norton *Fused Stabilized Zirconia* Permit Technical Advances in Processing

None other like it! No other refractory offers such an unusual combination of properties as new Norton Fused Stabilized Zirconia.

Its *resistance to high temperature* — its *low thermal conductivity*, despite its relatively heavy weight—its great *strength* at elevated temperatures—its resistance to *oxidizing and reducing atmospheres* at high temperatures — its *chemical inertness* — and its amazing *electrical resistivity* all combine to make a refractory that promises revolutionary advances in the processing field.

For Metal Melting

For processing precious metals in high frequency induction furnaces, Norton Fused Stabilized Zirconia crucibles or cement linings are ideal because metal does not wet them. This means that you can use the same furnace interchangeably without contamination of different alloys. What's more, Fused Stabilized Zirconia permits 100% recovery of melt from furnace linings. And you can depend on it for long life. It is unaffected by operating temperatures from 3200° to 3600° F. in metal melting furnaces.

For processing ferrous alloys, too, the non-wetting property of Norton Fused Stabilized Zirconia permits its use in many pouring and melting operations.

For Chemical Processing

Fused Stabilized Zirconia is first choice on operations where excellent insulating and refractory properties are required, such as burner tunnels and furnace linings in combustion chambers. It withstands temperatures as high as 4500° F. In addition to its high temperature resistance, its low specific heat and low conductivity make it profitable on certain gas synthesis operations. Its chemical inertness also makes it valuable on certain types of processing where this property is important.

For Ceramics

Fused Stabilized Zirconia is highly recommended as setter tile for firing ceramic bodies such as barium titanate dielectrics and piezoelectrics, and some ferro magnetics. It does not react with or discolor ware. And its long life and thermal shock resistance make it particularly desirable for lining high temperature kilns and for fired shapes and grain in insulating all types of furnaces. It replaces carbon products in neutral and oxidizing atmospheres and is preferred for thermal insulation in molybdenum and platinum wound furnaces.

Write for further information

For complete data on further applications and detailed description of the new Norton Fused Stabilized Zirconia, ask your nearby Norton representative for Form 1409, or send coupon below.

Some of the many refractory shapes made of Norton Fused Stabilized Zirconia are pictured here.

NORTON COMPANY
507 New Bond Street, Worcester 6, Mass.
Gentlemen:
Please send me without obligation Form 1409 describing Norton Fused Stabilized Zirconia. I'm interested in investigating its use for:

- ☐ Lining Furnaces or Reactors
- ☐ Batts for Firing Titanates
- ☐ Metal Melting
- ☐ Electric Heater Elements
- ☐ Thermal Insulation (Other applications) .....

Name .....
Title .....
Company .....
Address .....
City ..... Zone ..... State .....

NORTON

Special REFRACTORIES

Making better products to make other products better

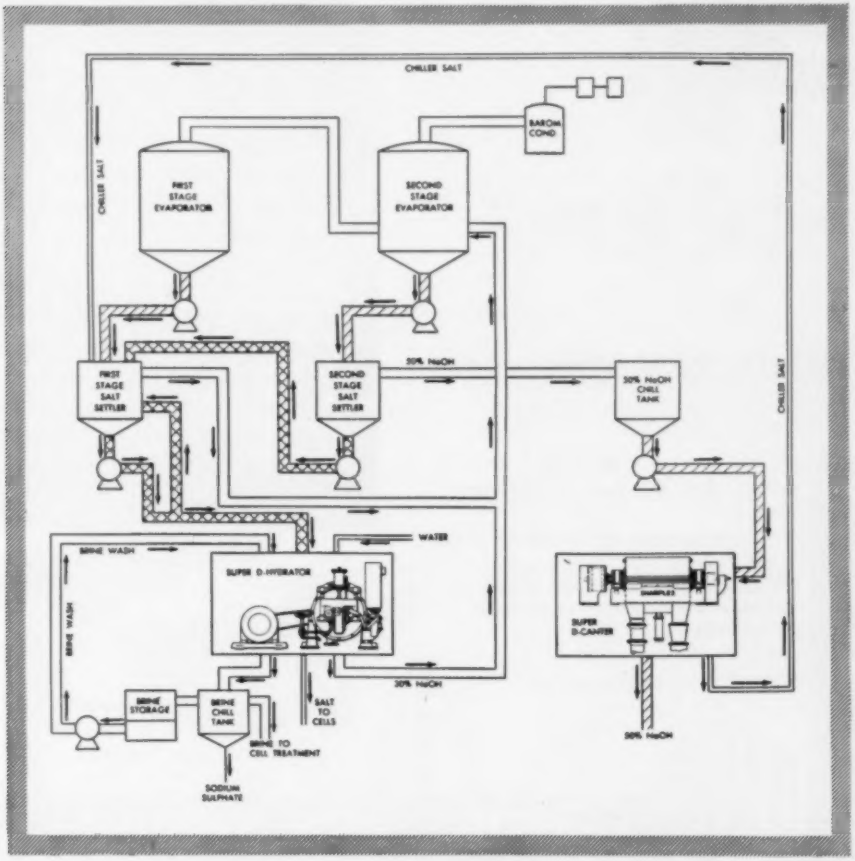
Canadian Representative
A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

a new application of centrifugal force

Substantial savings in capital investment and operating costs for producers of electrolytic caustic soda . . . the result of a new Sharples Corporation development which makes use of a heretofore unexploited phenomenon—the solubility of "insoluble" sodium sulphate in brine, in a super gravitational field.

The name Sharples is usually associated with a complete line of centrifuges; however many significant innovations in process engineering emerge from our constant research with industry in the more effective application of centrifugal force.

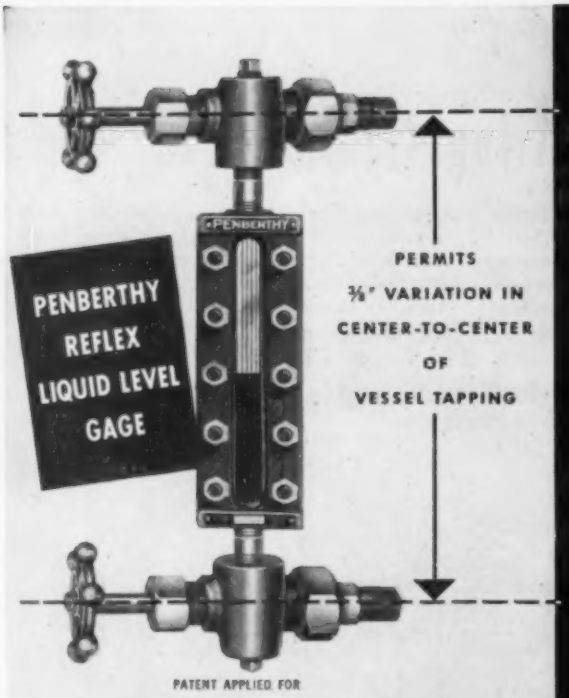
Sharples' doors are always open . . .



SHARPLES

THE SHARPLES CORPORATION • 2300 WESTMORELAND STREET, PHILADELPHIA 40, PENNA.

NEW YORK • BOSTON • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON



PATENT APPLIED FOR

Another PENBERTHY First

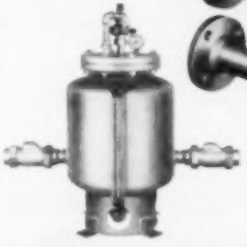
PENBERTHY "Floating Shank" *Saves Time and Money* in Gage Installation

A feature available only on Penberthy drop forged steel (and alloy) gage valves, the "floating shank" automatically compensates for as much as ⅜" variation in the center-to-center distance of the vessel tapping. This saves time and cuts the cost of gage installation . . . eliminates stresses often induced during mounting. Penberthy "floating shank" is available at slight additional cost. It will pay you well to specify "floating shank" on your next gage order.

OTHER PENBERTHY PRODUCTS

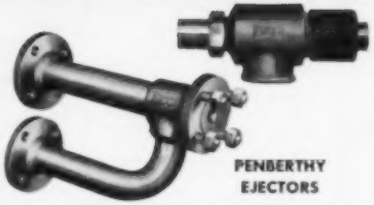
PENBERTHY TRANSPARENT GAGE

Used to observe color and density of liquids under high pressures and/or temperatures. Exceptionally sturdy construction—liquid chamber machined from solid block of metal. Ask for Catalog 35.



PENBERTHY CYCLING JET PUMPS

Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.



PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Made in wide variety of materials and special units developed to meet unusual conditions. Ask for Bulletin 512.

4671

PENBERTHY INJECTOR COMPANY
DIVISION OF THE BUFFALO-ECLIPSE CORPORATION
DETROIT 2, MICHIGAN
Established 1886 — *Canadian Plant, Windsor, Ontario*

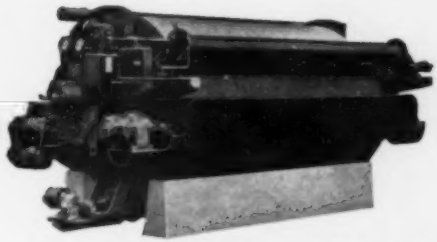
valve after Valve after VALVE

OLIVER

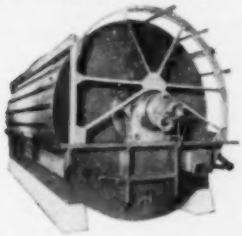
Each the Nemesis of Pulps Forming Thin, Sticky, Flow-Retarding Cakes

Precoat FILTER

Panel FILTER



• The Oliver Precoat Filter operates in continuous cycles with a pre-formed 'precoat' of suitable porous material such as diatomaceous earth. Solids form a thin film on the surface of this precoat which is shaved off by a traveling knife edge as the drum rotates, leaving continually a fresh surface of precoat for cake deposition. Actual filtration continuous for periods ranging from 8 hours to several weeks before the precoat is used up and a new one has to be formed. Precoating takes an hour or two.



• The Oliver Panel Filter in contrast to the Precoat Filter doesn't use a precoat. Nor is there any wire winding to hold the cloth on the drum. An ingenious discharge mechanism picks the thin cake off the cloth leaving it clean and ready for further cake deposition. The cloth is in a relatively small piece and is held in place by caulking into recesses between sections.

WHY two distinctly different filters for handling pulp forming one class of filter cake? Another question answers that one: "What do you want to do with the cake? Keep it or throw it away?"

The Precoat Filter makes use of a pre-formed layer or 'precoat' of filter aid which, as it is removed with the cake, mixes with it. Usually such cakes are discarded, although it is often possible to separate the solids from the precoat by a suitable solvent.

The Panel Filter does not use a precoat or pre-formed layer of filter aids. Thus it discharges the solids uncontaminated in any way. It, too, handles easily those thin, sticky, flow-retarding cakes. It is usually recommended when the cake is valuable or is to be processed further. We call these two filters to your attention in case you wish to obtain the advantages of continuous and automatic filtration of a pulp that for one reason or another produces an extremely thin cake.

New York 18 — 33 W. 42nd St. Chicago 1 — 221 N. LaSalle St.
Oakland 1 — 2900 Glascock St. San Francisco 11 — 260 Calif. St.
Export Sales Office — New York • Cable — OLIUNIFILT

FACTORIES: Hazleton, Pa. Oakland, Calif.

OLIVER UNITED FILTERS OUF INC.

WORLD WIDE SALES, SERVICE AND MANUFACTURING FACILITIES

CANADA
E. Long, Ltd.
Orillia, Ontario

MEXICO & CENT. AMERICA
Oliver United Filters Inc.
Oakland, Calif.

EUROPE & NORTH AFRICA
Dorr-Oliver S. A. Brussels
Dorr-Oliver S.N.a.R.L. Paris
Dorr g.m.b.h. Wiesbaden (16)
Dorr-Oliver Co., Ltd., London, S.W. 1
Dorr-Oliver S.a.R.L. Milano
Dorr-Oliver, N.V. Amsterdam-C

PHILIPPINE ISLANDS
E. J. Nell Co.
Manila

HAWAIIAN ISLANDS
Honolulu
A. R. Duvall

WEST INDIES
Wm. A. Powe — Havana

SOUTH AMERICA & ASIA
The Dorr Co., New York

AUSTRALIA
Hobart Duff Pty., Ltd.
Melbourne

SOUTH AFRICA
E. L. Bateman
Johannesburg, Transvaal

valve after Valve after VALVE-

Processing Industries rely on...

BS&B

Type 86-Climax DIAPHRAGM CONTROL VALVES

AT WARREN PETROLEUM COMPANY'S big, ultra-modern Gladewater, Texas gasoline plant, Climax valves and controls are standard —as these Type 86R fuel gas regulators.

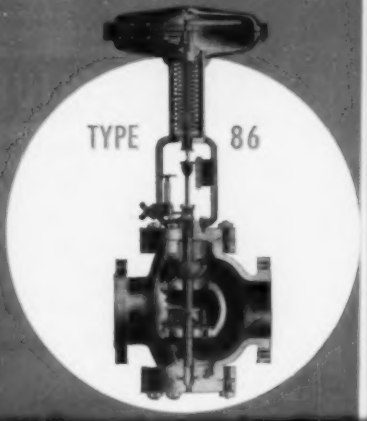
Control of flow, liquid level, pressure and temperature is best achieved by BS&B's Type 86 Climax valves—whether the medium is air, gas, vapor liquid or steam. In any industries where trouble-free performance and ease of maintenance are important—Climax 86 valves have proved their reliability and versatility. BS&B Climax control valves feature wide range, high-lift, true-aligned, reversible inner valves, minimum hysteresis, chattering and shock. Bolted down yokes give added strength so valves can be installed in any position. Face-to-face dimensions of flanges are standard.

A Climax Type 86 is available to you for any control application—with single or double port, reversed topworks, single or double diaphragm, with hand wheels, finned cooling section, purged gland section, bellows stem packing, steam jacketed valve bodies and valve positioners. Pressure ranges are from 125 to 5000 psi; sizes range from ½" to 4" in single port, ½" to 16" in double port valves.

The superiority of Climax valves does not depend alone on their unique design—but on the exacting accuracy of their manufacture, accuracy that demands close tolerances for acceptance by BS&B's Climax Controls Engineers.

CLIMAX CONFIDENTIAL ENGINEERING SERVICE

is available for all your controls problems. You need not hesitate to call on Climax Engineers for assistance—BS&B's reputation for 58 years of customer service stand behind them. Write today for complete, illustrated literature on the construction, specifications and applications of Climax Diaphragm Control Valves.



CLIMAX BS&B CONTROLS

BLACK, SIVALLS & BRYSON, INC.

CLIMAX CONTROLS DIVISION, DEPT. 401

7500 EAST 13TH STREET KANSAS CITY 3, MISSOURI

LARGE *Meat Packing Company*

SOLVES DIFFICULT CLEAN-UP PROBLEM

● You can't clean equipment with hose that makes marks! A large midwestern meat packer satisfied himself on this score by attempting to use ordinary makes of washdown hose for cleaning stainless steel processing equipment.

The hose just didn't work! Everything it brushed against got branded with dirty black smudges. Hose covers wore off prematurely on hard cement floors. Action of scalding water caused hose tubes to swell and break loose from the carcass. This tremendously reduced hose efficiency and caused dangerous blowouts.

The problem was turned over to Republic's local distributor, who recommended use of Republic Creamery Hose . . . a lightweight, flexible carrier, built with grease and abrasion-resisting white covers that never leave stains.

Since then there's been no sign of trouble, and after a long period of continuous service the Republic Hose remains in top working condition.

Republic Creamery Hose is just one of the complete line of Republic's Industrial Rubber Products designed to give you better performance at reduced costs. Write us direct or contact your local Republic Distributor for a free analysis of your job requirements.

FLEXINEERING

PENFLEX'S ANSWER TO YOUR FLEXIBLE TUBING PROBLEMS

An extra man to help you plan new products requiring flexible tubing or to solve problems on old products. That's the service Penflex's "Flexineering" offers you. Flexineering is the scientific application of the right size, weight and type of flexible tubing on the right installation or product to assure the longest life with the greatest efficiency.

Coast to coast . . . border to border, Penflex installations prove the value of "Flexineering."

When you require tubing or hose that is as tight as a pipe but flexible, safe at high temperatures . . . free from metal fatigue . . . specify Penflex.

Penflex manufactures a complete line of four wall interlocked and seamless welded corrugated flexible tubing in sizes from 1/8" to 30" I.D. Write today for your copy of "Flexineering."

Pennsylvania Flexible Metallic Tubing Company, Inc., 7234 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: Boston • New York • Chicago • Houston • Cleveland • Los Angeles

penflex

HEART OF INDUSTRY'S LIFE LINES

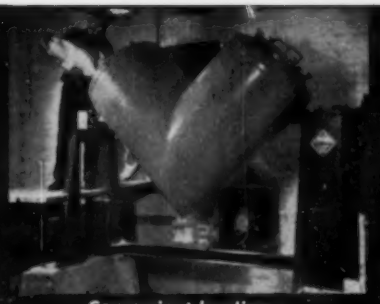
Ends Powder Caking for DAVIES-YOUNG

For some time, Davies-Young's detergent, "Dy-Sulph," had been produced in a small way in a ribbon blender. Disadvantages of that method were two-fold: the blender was too small and the blended powder had a tendency to cake. One of their suppliers recommended a **p-k** Twin Shell Blender* as the most satisfactory way of overcoming both difficulties.

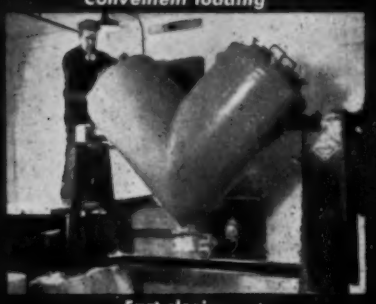
Today, production has been materially increased, the powder is perfectly uniform, with the caking factor eliminated. Cleaning is simplified by the baffle-free design of **p-k** Blenders—loading and unloading time has been reduced. **p-k** Twin Shell Blenders mix dry materials faster and to greater uniformity than any other blender. Production units have a capacity range of from 1 to 250 cubic feet and operate at speeds from 6 to 29 rpm.

You will want to know more about the uniformity and increased production obtainable with **p-k** Twin Shell Blenders—send for catalog 401 on production models and catalog 402 on laboratory models. **p-k** will be pleased to run a test blend of your materials to demonstrate the outstanding merit of this new but service-proved method of dry blending.

*Patented



Convenient loading



Fast closing

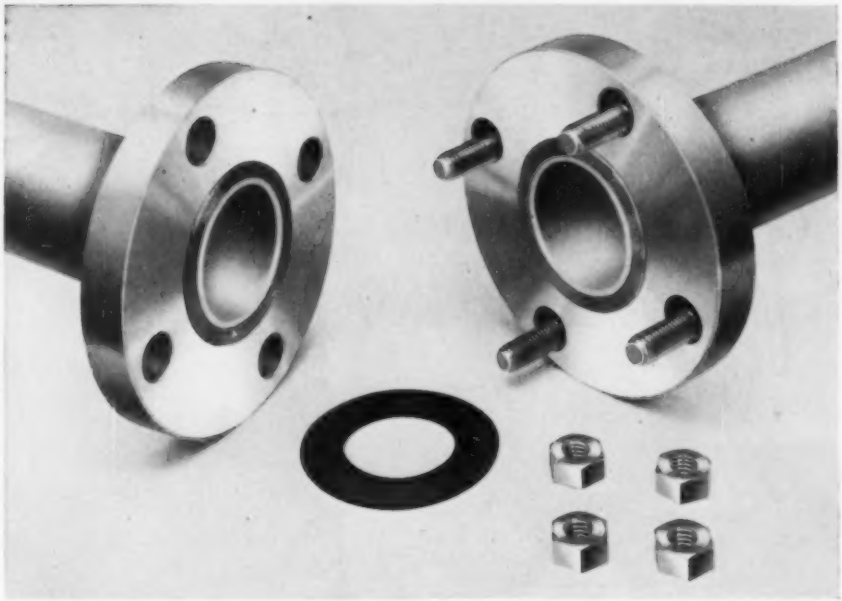
Dustless discharge

Simply Designed for Better Blending

the Patterson-Kelley Co. Inc.
23 Lackawanna Ave.
East Stroudsburg, Pennsylvania

1005

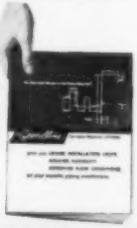
Speedline Corrosion-Resistant FITTINGS



help reduce your piping costs and simplify pipeline assembly

Here's the double advantage *Speedline* Fittings give you. First, you can use light-walled Schedule 5 corrosion-resistant pipe. That gives you a far less costly installation and it conserves critical alloys. Second, because of their special design, *Speedline* Fittings are easier to use than other types of fittings. So you get real advantages in savings of assembly time.

The new *Speedline* Fittings catalog shows you how to improve your piping jobs at less cost than you have paid in the past. A note on your company letterhead will bring you a copy. Write today.



Speedline insert flange

Corrosion-resistant serrated insert in a carbon steel flange. Only tools needed for assembly are a standard expander and open-end wrench.

Speedline tube union

Combines best features of screwed pipe and sanitary unions; eliminates leakage encountered with ground joint type fittings.

Speedline aligning connector

Joins pipe schedules 5, 10 and 40. Also made for use with tubing.

Speedline Corrosion-Resistant FITTINGS

—the newest thing in pipeline economy

HORACE T. POTTS CO. *Since 1815* Erie Avenue & D Street • Philadelphia 34, Pa.

SOAPS... DETERGENTS

a billion dollar industry relies on

HOOKER

Basic Chemicals: caustic soda, chlorine and hydrogen produced in Hooker Type S-3 electrolytic cells.

Take a tip from the booming soap-and-detergent industry, which places a bigger order each year for heavy chemicals from Hooker.

The billion-dollar-a-year soap industry is one of 30 served by Hooker. As specialists in chlorination, we offer *your* industry:

- a wide selection of chlorinated organic and inorganic compounds
- capable help in developing special chlorinated intermediates
- high-purity caustic soda, sulfides and other bulk chemicals

Deliveries are scheduled to tie in as closely as possible with your processing needs. Exact status of each shipment is carefully checked . . . instantly available to you at all times.

Write, on your business letterhead, for General Products List 100, and for Technical Data Sheets on specific Hooker Chemicals in which you are interested.

HOOKER CHEMICALS USED BY THE SOAP-AND-DETERGENT INDUSTRY

ALUMINUM CHLORIDE
CAUSTIC SODA
CHLORINE
CYCLOHEXANOL
METHYL CYCLOHEXANOL
MONOCHLOROACETIC ACID
MURIATIC ACID

DELIVERIES: Several of the Hooker Chemicals listed here are available now; some in limited quantities. Others will be available in the near future. Your Hooker sales representative will be glad to keep you posted on the current delivery situation.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

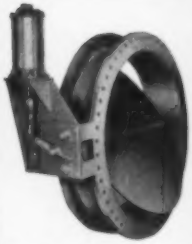
HOOKER CHEMICALS

1-1742

PARADICHLOROBENZENE • LAURYL CHLORIDE • SULFUR CHLORIDES • CAPRYLYL CHLORIDE • CHLOROPARAFFIN • SODIUM SULFIDE

No. 797—24-inch heavy duty electric motor operated valve. Handwheel for manual use in case of current failure.

No. 700—20-inch class "B" cast iron valve equipped with heavy duty handwheel control and threaded reach rod.



No. 627—Cylinder operated 60-inch heavy duty valve (either pneumatic or hydraulic control).

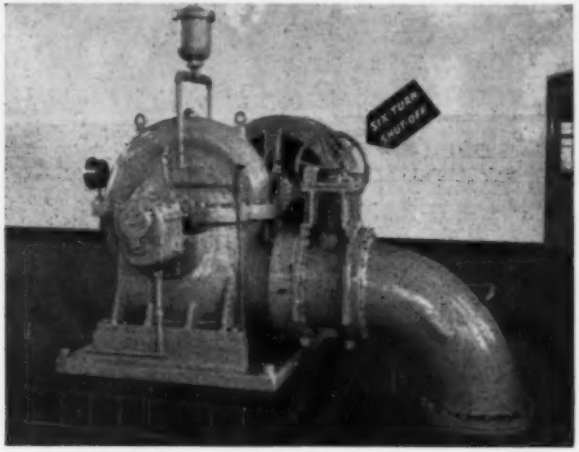
•

R-S Valves are synonymous with the simplified control and shut-off of any material that flows or is forced through a pipe, under a wide range of pressure and temperature.

•

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



ATLANTIC CITY Simplifies PUMP SHUT-OFF

New pumping units of the modern Atlantic City Pumping Station supplying water for this seashore resort are equipped with 125-pound handwheel operated R-S valves.

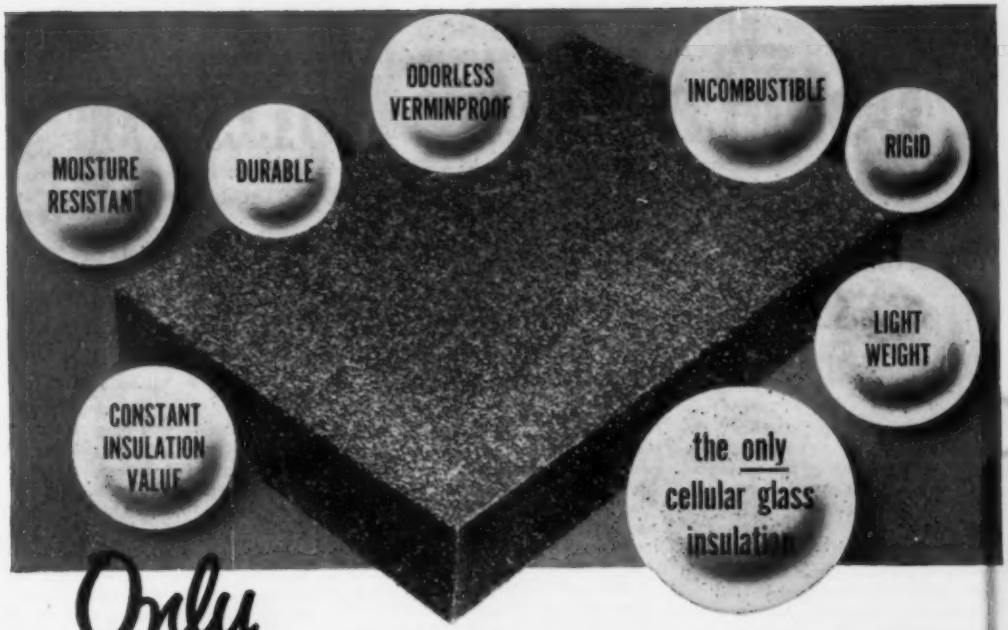
The valve illustrated above is closed in a matter of seconds (only six handwheel revolutions required) before the pump is started in order to prevent an overload on the pump and motor. The valve is then opened gradually and easily regulated according to demand.

Such valves can be equipped with hydraulic cylinders (tapped into the pipe line before and after the pump). As long as the differential pressure remains above a predetermined value, the cylinder will hold the valve open. Power or mechanical failure will cause a drop in the differential pressure, and the cylinder will close the valve automatically. Water hammer is impossible since the valve closes only as fast as the adjustable cylinder bleeds.

Specify R-S Valves for simplified construction and operation.

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.
An S. Morgan Smith Company Subsidiary

DISTRICT OFFICES IN PRINCIPAL CITIES



Only FOAMGLAS®

gives you all these advantages

FOAMGLAS is the only insulating material composed of millions of tiny glass bubbles containing still air. Still air is the world's best practical insulation. And glass, in this cellular form, has exceptionally high resistance to many elements that cause other insulating materials to deteriorate.

That is why FOAMGLAS, the only cellular glass insulating material, is such an effective, long lasting, economical insulation.

The eight features mentioned above are the main reasons for the rapidly increasing use of FOAMGLAS on hot and cold pipe lines, on tanks, towers, and other processing equipment.

When next you figure on insulation, be sure to get all the advantages you enjoy only with FOAMGLAS. Send the coupon for sample and informative booklet.

PITTSBURGH PC CORNING ®

Pittsburgh Corning Corporation
Dept. CC-12, 307 Fourth Avenue, Pittsburgh 22, Pa.

Please send me without obligation a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

Name.....

Address.....

City.....State.....

PITTSBURGH CORNING CORPORATION · PITTSBURGH 22, PA.

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION
COPPER ALLOY BULLETIN
"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Studies of Biofouling in Sea Water Aid in Selecting Condenser Tube Alloys

The extensive tests conducted by the Bridgeport Brass Research Laboratory have revealed much useful information on the nature and extent of biofouling of copper-base alloys in sea water.

In a typical test at Kure Beach, specimens of various copper and copper-base alloys were arranged at random in a specially-designed rack. They were suspended about 15 inches below the surface of a stream of sea water flowing between 2 and 3 feet per second. Samples were under test from 6 months to 7 years.

Extent of Biofouling Measured

Early in the tests it was noted that some alloys were badly biofouled by relatively large marine flora and fauna, while others were practically unaffected. The extent of biofouling in terms of per cent of surface covered by marine organisms is given in Figures 1 and 2, which also give the total rate of corrosion and the calculated loss of copper for each of the condenser tube alloys tested.

Biofouling Leads to Pitting

It is interesting to note that wet, living biofouling can be quite easily removed from most specimens by scrubbing with a stiff fiber brush and water. Such scrubbing leaves only a thin layer of corrosion product on the specimen. However, if the biofouling is allowed to die and dry for one to two weeks, considerable difficulty is experienced in removing those organisms with calcareous bases such as barnacles. The cone of the dead barnacle is usually sheared off, leaving the more or less circular base adhering to the metal. Barnacles whose shells had turned green produced small pits approximately 0.0005 in. up to 0.007 in. deep. No pits were detected when the specimens were removed from the water while the barnacles were still alive (not green).

From a practical standpoint, it is important to prevent biofouling from taking place on metal surfaces. This can be done by operating the water velocity high enough to prevent organisms from attaching themselves to the tube wall and by periodic chlorination.

All of the specimens were covered with a slime which was microscopically identified as being primarily microalgae which were living on these corroding metal surfaces. No evidence was found, however, to indicate that the algae (macro or micro) contribute to accelerated corrosion in stress-free specimens submerged in sea water.

Effect of Alloying Elements

The addition of 5% aluminum to copper did not appreciably change the rate of corrosion, but the presence of aluminum did for some reason or other make the aluminum bronze quite susceptible to biofouling. The addition of arsenic to the 5% aluminum bronze reduced the corrosion rate approximately 50% and increased the susceptibility to biofouling. The addition of 2% aluminum and 0.02% arsenic to a 75/25 copper-zinc alloy (aluminum brass) reduced the corrosion rate approximately 70% and very markedly increased the susceptibility to biofouling. The addition of 0.42% iron to 70/30 cupro nickel reduced the corrosion rate about 80% and simultaneously increased the susceptibility to biofouling.

Such tests combined with experience in the field regarding the behavior of alloys in actual service are useful in helping to select alloys for longer service life.

It should be noted that the alloys showing increased resistance to corrosion are more susceptible to biofouling. Consequently, in order to realize the benefits from increased resistance to corrosion, such alloys must be kept free from biofouling. (7639)

Fig. 1—Extent of biofouling versus rate of corrosion of condenser tube alloys in sea water

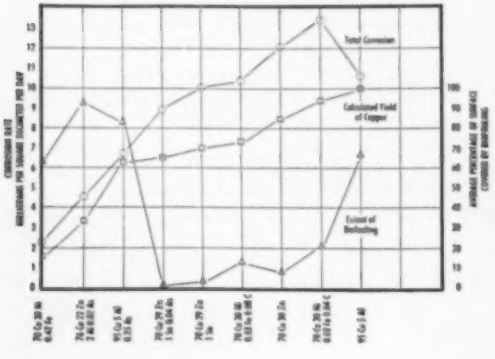
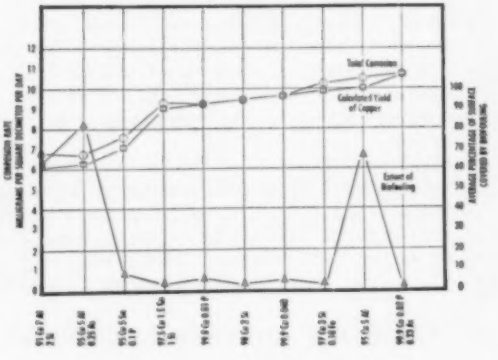


Fig. 2—Extent of biofouling versus rate of corrosion of copper and bronzes in sea water



Formaldehyde

by Celanese

Write for your copy of recently published catalog "Celanese* Organic Chemicals."

Chemicals by Celanese:

ACETIC ACID
BUTYL ALCOHOLS
n-PROPANOL
METHANOL
ACETALDEHYDE
FORMALDEHYDE
FORMALDEHYDE IN ALCOHOLS
PARAFORMALDEHYDE
BUTYLENE GLYCOLS
DIPROPYLENE GLYCOL
PROPYLENE GLYCOL
ACETONE
PROPYLENE OXIDE
TRICRESYL PHOSPHATES
SPECIAL SOLVENTS

Every day more plants are depending on Formaldehyde by Celanese.

Among the world's largest producers, Celanese processes from selected petroleum hydrocarbons . . . *production is not dependent on methanol.*

Contract for your Formaldehyde needs from Celanese, and give your business the benefits of Celanese quality and service. Celanese Corporation of America, Chemical Division, Dept. 500-A, 180 Madison Avenue, New York 16.

A chemical by Celanese is always a better buy. The integrated, self-contained Celanese method of manufacture insures 5 points of advantage for your business.

- **Production by oxidation of selected petroleum hydrocarbons**
- **Complete shipping service: tanker, barge, tank car, tank truck, drum**
- **Terminals and distribution points in key locations**
- **Research that anticipates industrial requirements**
- **Expansion program that looks forward to your growing needs**

Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

CLEANS
Fouled Heat Exchanger Tubes QUICKLY...

WILSON
TP-301 CLEANER

This high speed tube cleaner is designed to increase output and minimize down-time. The improved Model TP-301 is the only tube cleaner which can remove deposits from completely plugged heat exchanger tubes . . . and other fouled straight tubes heretofore not considered practical to clean.

Many improvements, resulting from years of field experience, have been built into the new TP-301 cleaner.

- **MORE POWERFUL**—operating speed up to 3500 RPM at 90 psi utilizing 130 cfm.
- **LIGHTER WEIGHT**—only 15 lb.
- **SHORTER**—only 13" overall.
- **INCREASED CAPACITY**—from ⅜" up to 2½" or even 3" O.D. tubes up to 40 ft. in length.
- **LOW AIR PRESSURE**—operates on air pressure as low as 50 lb.
- **LOW HEAD ROOM NEEDED**—minimum practical working head room 5 ft.
- **COSTS LESS** than previous models.

VARIOUS CARBIDE BITS AVAILABLE

Send for Bulletin giving complete details on this man-hour and money-saving tube cleaner

WILSONIZE TO ECONOMIZE

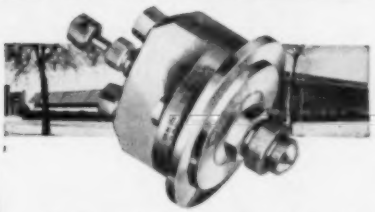
THOMAS C. WILSON, INC. 21-11 44th AVENUE, LONG ISLAND CITY, N.Y.

CABLE "TUBECLEAN" NEW YORK

TW 784A **WILSON**

TUBE CLEANERS · TUBE EXPANDERS

to the 99 plants in 100 who use SPRAY NOZZLES



WRITE FOR

In the search for doing things better and faster, have you overlooked the importance of spray nozzles? Your application may be commonplace or complex . . . but whatever it is, properly engineered spray nozzles can make a vast difference. Let Spraying Systems Co., America's foremost authority on industrial spray nozzles show you why and how. As a first step, write for catalogs.

SPRAYING SYSTEMS CO.

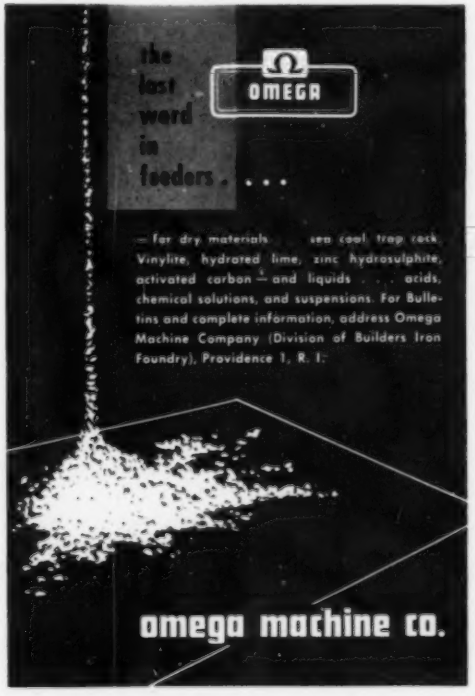
Engineers and Manufacturers

3275 Randolph Street

Bellwood, Illinois

Catalog No. 22
General Industrial Spray Nozzles

Catalog No. 23
Pneumatic Atomizing Nozzles


the last word in feeders . . .
OMEGA
— for dry materials . . . sea coal, trap rock, Vinylite, hydrated lime, zinc hydrosulphite, activated carbon . . . and liquids . . . acids, chemical solutions, and suspensions. For Bulletins and complete information, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, R. I.
omega machine co.

IF IT'S

here...

IT'S **news...**

IT'S WORTH STOPPING TO SEE!

Maybe Industry doesn't maintain show windows on Fifth Avenue or State Street or Wilshire Boulevard like America's great department stores. But your industry has a mighty effective show window... and this is it... this magazine. In these advertising pages alert manufacturers show their wares. Here you will find up-to-the-minute news about products and services designed to help you do your job better, quicker, and cheaper.
To be well-informed about the latest developments in your business, your industry... and to stay well-informed... read all the ads too.

McGRAW-HILL PUBLICATIONS

Expansion at BRILLO includes: STANDARDAIRE BLOWERS

Installation of Standardaire Blower at Brillo Manufacturing Co.

TO keep pace with the ever increasing demand for Brillo Manufacturing Company products, numerous plant additions have been made since 1913, when the company first started operations. Another million dollar expansion program is now underway—when completed it will provide increased floor space for greater productive capacity. In conjunction with this program Brillo has installed two 105B2S Standardaire Blowers, each having a capacity of 3600 c. f. m. at 1750 r. p. m. These blowers are in continuous round-the-clock service, supplying the necessary air to whisk away the metal turnings incidental to the processing of the famous Brillo pads. Standardaire Blowers are built to take this grueling service in stride. Rigid material specifications and skillful workmanship assure long, trouble-free performance, even when operating under extraordinary conditions. Standardaire Blowers are winning new users every day due to their ability to produce more air in less space with less power consumption.

For complete information write Dept. E3S
READ STANDARD CORPORATION,
370 Lexington Avenue, New York 17, N. Y.

BLOWER-STOKER DIVISION

FORMERLY The Standard Stoker Co., Inc.
ONLY THE NAME IS CHANGED

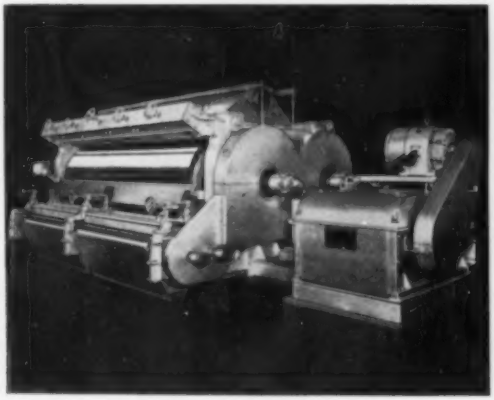
READ STANDARD
CORPORATION

NEW YORK • CHICAGO • ERIE • YORK • LOS ANGELES

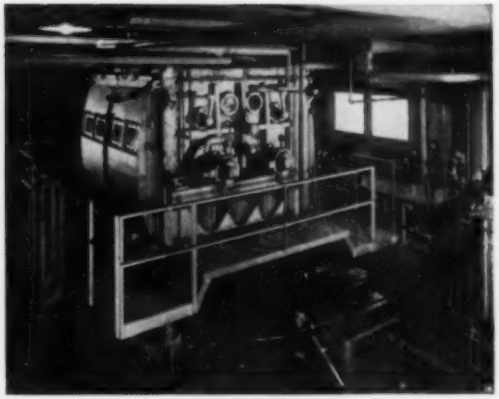
A Headline that is also a Helpline!

1	**BUFLOVAK DRUM DRYERS**	Liquid materials of limitless variety are successfully dried on the many type BUFLOVAK Atmospheric and Vacuum Drum Dryers.
2	**CONTINUOUS DRYING FOR LIQUID MATERIALS**	More and more products are being dried by this continuous, one-step process; chemicals . . . foods . . . pharmaceuticals. And, your product may be the new name tomorrow.
3	**LARGE CAPACITY . . . LOW COST**	Costs are lower and production greater, because drum drying is a one-step, continuous process, from liquid to dry product . . . quick as a wink.
4	**SAFE DRYING**	Quick, low-temperature drying . . . protection from contamination . . . freedom from dust or toxic hazards, are advantages only BUFLOVAK can offer.
5	**GIVE THE RESULTS YOU WANT**	You get the results you want because only BUFLOVAK builds all the different types and knows from experience what to recommend.

Catalog No. 348 has complete information. May we send you a copy?



Soap is dried on this special BUFLOVAK Atmospheric Double Drum Dryer equipped with cooling rolls.



BUFLOVAK Vacuum Double Drum Dryer, sanitary type, Stainless Steel, with chrome plated drums. Used for drying a food product.

Buflovak Equipment

DIVISION OF BLAW-KNOX COMPANY 1549 FILLMORE AVE., BUFFALO 11, N. Y.

BUFLOVAK BUILDS

Evaporators
- Low Temperature
- By-Product Recovery
- Chemicals
- Food Product
- Crystallization

Dryers
- Vacuum Double Drum
- Vacuum Rotary
- Pilot Plant
- Atmospheric

Processing Kettles
- Mixers
- Impregnators
- Dopp Kettles
- Solvent Recovery & Distillation Equipment

BUFLOVAK RESEARCH AND TESTING LABORATORY

To assist you in the solution of processing problems, BUFLOVAK offers the facilities of its Research and Testing Laboratory—where small scale experimental units show you, before you buy, the commercial possibilities, data on production cost, and characteristics of the finished product.

OVER 40
DIFFERENT • WEAVES •

COTTON AND SYNTHETIC FILTER FABRICS

Filter Twills and Chain Cloths
Filter Flannels etc.
for
Plate & Frame Presses
Sector Filters
Rotary Filters
in all sizes

VINYON • SARAN
NYLON • STANTEX

Acid & Alkali Resistant
To Corrosive Solutions
Dust Collection Bags of all Kinds
Fabricated to Meet Specifications

Write for Samples. Submit Details

WM. W. STANLEY CO.
401 Broadway New York 13, N. Y.

MERCOID

FOR INDUSTRIAL APPLICATIONS REQUIRING POSITIVE CONTROL OF PRESSURE, TEMPERATURE, LIQUID LEVEL ETC.

They Have What Experienced Engineers Want—
POSITIVE SAFETY
EASE OF INSTALLATION
CONVENIENT ADJUSTMENTS
YEARS OF DEPENDABLE PERFORMANCE

CONTROLS PERFORM IMPORTANT RESPONSIBILITIES, AND SHOULD BE SELECTED WITH DISCRIMINATION

MERCOID
Is your guarantee of Complete Satisfaction

WRITE FOR CATALOG 700 -- PLEASE MENTION THIS PUBLICATION

THE MERCOID CORPORATION
4201 BELMONT AVE. CHICAGO 41, ILL.

Deming Pumps

Proper pump selection increases efficiency and reduces costs of operation and maintenance.

Proper pump selection demands FREEDOM of selection for type, size, capacity, head, and other factors.

Countless thousands of industrial pump specifications are met with "precision accuracy" by the great diversity of DEMING PUMPS.

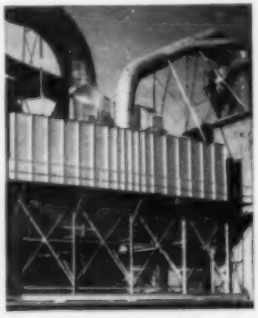
Deming Distributors in your area offer you "on-the-spot" cooperation to match the right pump to the job. If you are not familiar with their locations, write us. Please state type or types of pumps in which you are interested.

THE DEMING COMPANY
525 Broadway • Salem, Ohio, U.S.A.

Dust is a serious threat to top-efficiency operation of your plant—but DRACCO DUST CONTROL EQUIPMENT can supply the positive, sure protection you need.

Modern, well-run industrial plants don't compromise with dust because they can't afford to. Compromising with dust means gambling with explosive dusts, exposing workmen to hazardous or toxic dusts, losing valuable materials, or ignoring higher operating costs and lower production directly resulting from uncontrolled dust.

DRACCO has the answers to industrial dust problems and has helped innumerable companies stop this threat to their efficiency and profits. DRACCO DUST CONTROL EQUIPMENT has found wide acceptance in industry because it incorporates proven designs, custom-engineering to specific requirements, and accurate fabrication—all based on DRACCO's 35 years of experience.

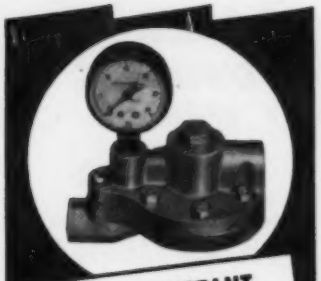


If uncontrolled dust is endangering your plant efficiency, why not call in DRACCO engineers for a specific recommendation on solving your problem?

DRACCO CORPORATION
4040 E. 116th St., Cleveland 5, Ohio
415 Lexington Avenue, New York 17, N. Y.

AGENTS IN PRINCIPAL CITIES

DRACCO *Performance Proved*
DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION



NEW CONSTANT DIFFERENTIAL RELAY
TYPE 6000

For purge systems, liquid level and specific gravity measurements.

Maintains constant purge rate regardless of down stream pressure changes • Supplied with fixed flow rate orifice • Eliminates supply pressure regulator • Pressure rating 600 P.S.I. • Supplied with differential indicator • Standard flow rates available .5-1-2-5-25-50 S. C. F. H.

Write for Illustrated Bulletin.

INSTRUMENTS, INC.
122 N. Madison Tulsa 6, Okla.

Send us a sample
OF ANY STOCK YOU WANT TO **PULVERIZE**

We'll make a test grind with

SCHUTZ-O'NEILL PULVERIZER

You will receive our Engineering Report suggesting the best method to use and the type of Schutz-O'Neill Pulverizer and any receiving or sifting equipment suited to your requirements.

SCHUTZ-O'NEILL offers you the benefit of more than a half century of experience in rapid, accurate, dustless pulverizing of any dry, grindable, non-gritty stock.

SCHUTZ-O'NEILL Pulverizers are made in 6 sizes with capacities up to 2000 lbs. per hr. Also Gyrator Sifters, Roller Mills, Receiver Boxes, Collectors, Hammermills, etc.

When sending sample, be sure to state fineness desired.

ESTABLISHED 1893 **SCHUTZ-O'NEILL CO.**
301 Portland Ave., Minneapolis 15, Minn.

AHCO

Fine Industrial Chemicals

SINCE 1815

★

ESTERS, PLASTICIZERS

AHCOLEINS

(A Complete Range of Highly Refined Red Oils)

WETTING AGENTS

STEARIC ACIDS

★

Product Samples and Literature on Request From Your Nearest AHCO office

ARNOLD, HOFFMAN

PROVIDENCE • RHODE ISLAND

Associated with

Imperial Chemical Industries Ltd.

London, England

ARNOLD, HOFFMAN & CO., INCORPORATED • EST. 1815

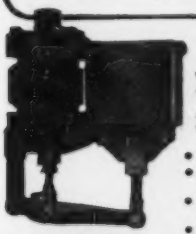
OFFICES: Charlotte, Cincinnati, New York, Tatnbora, Providence

PLANTS: Charlotte, N. C. • Cincinnati, Ohio • Dighton, Mass.

Quality • Integrity • Service • Quality • Integrity • Service

JOHNSON *Direct Acting Solenoid Valve — for 150 lbs. Differential Pressure . . .*

You *can* get a solenoid valve that operates under differential pressures up to 150 lbs., temperatures to 400° F., *without pilot valves.* It ends the time lag and wiredrawing that come with slow opening—the danger of sticking that comes with auxiliary pistons. Used for all types of automatic, or remote, flow control. Available for normally closed or normally open service; with stainless steel valve and seat or Jenkins disc; in sizes from ½" to 3".



WHERE CAN YOU USE THIS AUTOMATIC VALVE?

- No pilot valves
- Temperatures to 400° F.
- Differential Pressures to 150 lbs.
- Immediate full flow
- Heavy duty construction

Write for Bulletin "V"

The Johnson Corporation

848 WOOD ST. THREE RIVERS, MICHIGAN

NEWARK "End-Shāk" TESTING SIEVE SHAKER

Motion is important in making sizing tests. Conforms to recommendations for the motion to be used when making hand tests, issued by the Bureau of Standards.

Here, in the Newark "End-Shāk" unit, you get proper sustained hand motion mechanically. You get the best motion without being subjected to any human variation or weakness. This sturdy testing machine holds up to 7 full height sieves or up to 13 half height sieves. It is designed for 8 inch diameter sieves. Standard ½ HP., 110-220 volt 60 cycle, 1750 rpm motor supplied. Special motor to order.

We'll be glad to send you prices and descriptive literature. And if you will outline your testing requirements we'll be glad to suggest the proper sieve series to use.

NEWARK for ACCURACY

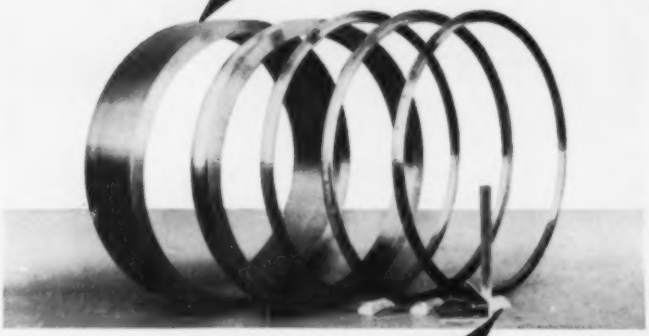
Newark Wire Cloth COMPANY

351 VERONA AVENUE • NEWARK 4, NEW JERSEY

Philadelphia 3, Penna. 1311 Widener Bldg. | San Francisco, Calif. 3100 19th St. | Chicago, Ill. 20 N. Wacker Dr. | New Orleans, La. 520 Maritime Bldg. | Los Angeles, Calif. 1400 So. Alameda St. | Houston, Texas P. O. Box 1870

DURASPUN

Centrifugally Cast



Machined and Finished

These are high alloy jet engine rings... all the work being done in our shop, starting with the centrifugal casting right through to the finished ring.

Centrifugally cast metal gives an exceptionally fine, dense, uniform grain structure. The strength of the metal approaches that imparted to a bar or ingot when it is hot forged. It produces an ideal metal for the tough service required of jet engine parts.

Incidentally, as evidence of our knowledge of and experience with tough alloy castings — static as well as centrifugal — the records show very few rejections by this engine manufacturer who subjected each of the many rings we furnished to his own very rigid tests.

May we suggest that you let Duraloy work on your high alloy castings — chrome iron, chrome nickel or nickel chrome? We have the experience and facilities for turning out high quality castings.

THE DURALOY COMPANY

Office and Plant: Scottdale, Pa. · Eastern Office: 2 East 41st Street, New York 17, N. Y.

Detroit Office: THE DURALOY COMPANY, 615 New Center Building

Your Guide to

PROFITABLE DRYING

describes the more than 30 types of **STANDARD-HERSEY DRYERS** for every Process Industry need.

Send **FOR YOUR COPY TODAY!**

Examples of how Standard-Hersey Dryers make money for their operators. Special features and advantages of Standard-Hersey Dryers, Kilns, Coolers and Calciners. How our "pilot" dryer takes guesswork out of dehydrating problems. Write for Dryer Bulletin 508.

STANDARD HERSEY *Dryers*

STANDARD STEEL CORPORATION

5005 Boyle Ave., Los Angeles 58

123-45 Newbury St., Boston 16

BEAKERS

POTS

STAINLESS STEEL

for all

CHEMICAL AND LABORATORY USE

We also manufacture other Stainless Steel Products. Buckets, Measures and other Special Products.

LEADING COMPANIES ARE OUR SATISFIED CUSTOMERS

AMERICAN METAL SPINNING AND STAMPING COMPANY

130 E. 13 St. N. Y. 3, N. Y.

Today's Swing is to

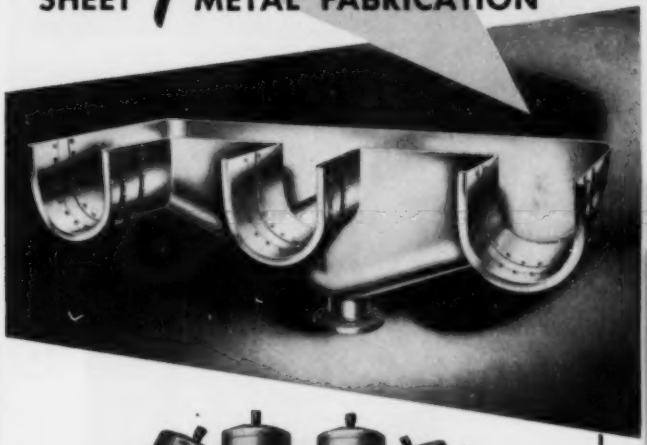
DARNELL
CASTERS & WHEELS

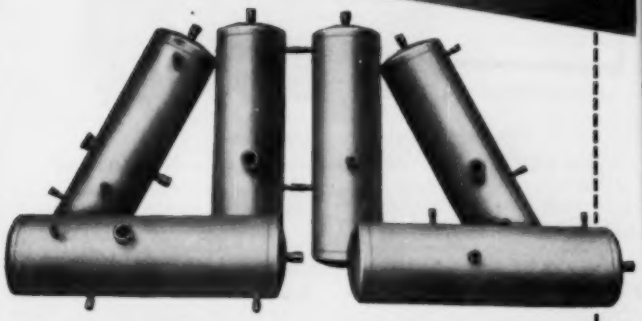
• Save Money, Floors, Equipment and Time by using DARNELL Casters and Wheels

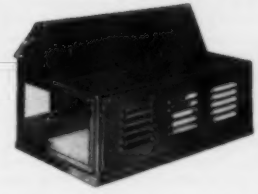
FREE Manual

DARNELL CORP. LTD.
LONG BEACH 4, CALIFORNIA
60 WALKER ST., NEW YORK 13, N.Y.
36 N. CLINTON, CHICAGO 6, ILL.

KIRK AND BLUM Special
SHEET METAL FABRICATION







Kirk and Blum is well equipped and experienced to fabricate your work to the most exacting specifications. We specialize in custom-built parts and assemblies of sheet steel, light plate, stainless, aluminum, monel and other alloys to ⅜" thickness.

Send us your prints for estimate. No obligation. Write for booklet "Sheet Metal Assemblies."

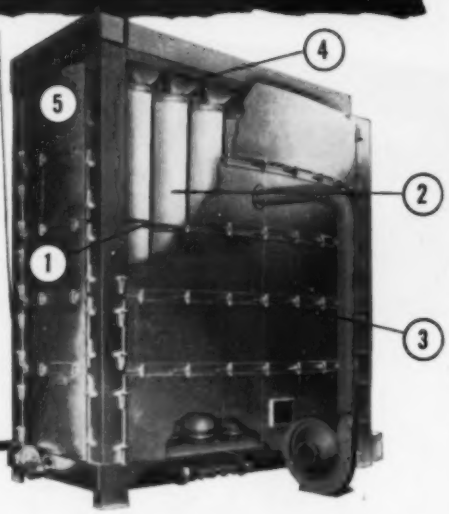
THE KIRK & BLUM MFG. CO.
3208 FORRER AVE.
CINCINNATI 9, OHIO

KIRK AND BLUM

ABSOLUTE RECOVERY OF THE FINEST DUST PARTICLES

DAY TYPE "AC" DUST FILTER

- 99.998% COLLECTION EFFICIENCY
- NO CLEANING SHUTDOWNS
- HIGH AIR TO CLOTH RATIOS
- SPECIAL FELT FILTER CLOTH



Licensed by H. I. Harvey, Jr.

The DAY Type "AC" Dust Filter provides more efficient filtering for many chemical dusts.

Here are several reasons for this outstanding performance, and why you can rely on the DAY Type "AC" Dust Filter to meet your dust filtering problems more efficiently and economically:

1 CONTINUOUS-AUTOMATIC OPERATION: reverse jet rings travel slowly up and down the tubes cleaning them continuously with a maximum cloth area loss of only 1¼% at any time. This eliminates cleaning shutdowns and provides continuous, automatic operation with constant air volume.

2 SPECIAL FELT FILTER CLOTH: the gentle, yet positive reverse jet cleaning action permits the use of this high grade wool filtering fabric which collects even the finest dust particles. (Actual tests have shown up to 99.998% collection efficiencies.) Also, the use of this type of cloth allows higher air-to-cloth ratios of 10, 15 or even 20 to 1 with uniform back pressures.

3 OUTSTANDING ADAPTABILITY: units can be furnished in multiples of 4 tubes; sectionalized steel panel housings (see illustration) for filters requiring vacuum or outdoor installations; quick opening clamps simplify erection and permit removal of sections for easy access to filter. (The DAY Type "AC" Dust Filter can be supplied without housing where housing is not essential.)

4 NO DUST CATCHING LEDGES: DAY Type "AC" Filters with a pattern of square-to-round inlet fittings, have no flat surfaces where dust can accumulate and become contaminated.

5 SEPARATED DUST STREAMS: one DAY Type "AC" Dust Filter is able to handle as many as four different product streams simultaneously, without mixing.

WRITE-TO-DAY FOR BULLETIN 491

DAY SINCE 1881

The DAY Company

856 3rd Ave. N. E., Minneapolis 13, Minn.
IN CANADA: P. O. Box 70N, Ft. William, Ontario
Branch Plants in Ft. Worth, Buffalo and Welland, Ontario

same working space

but CAPACITY DOUBLED with a Cowles

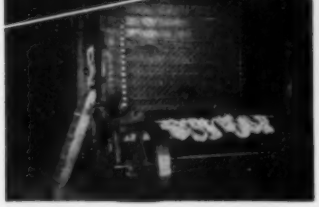
Stymied by insufficient dissolving capacity? Then replace your present mixer with a Cowles Dissolver — it more than doubles your capacity in the same working space!

THE COWLES DISSOLVER is a high-speed unit. Its impeller operates at velocities up to 7,500 f.p.m. And that means dissolving and dispersing move 2 to 20 times faster — that you save time and labor while improving your product. It's rugged, fast-loading, easily maintained — performs tasks other mixers cannot because it's engineered to the job.

WRITE FOR CATALOG on Cowles Dissolvers! And ask to have a detailed test run on your materials — no obligation.

The Cowles Company
INCORPORATED
112 TRACKSIDE • CAYUGA, N. Y.

this conveyor belt is woolly, but not wild!



That's a true turnabout for this example of a specially designed Cambridge woven wire conveyor belt. This one carries wet, washed wool through a drying oven to remove moisture and washing chemicals from the fibre. There's no wild belt travel because the Cambridge Chain Drive design used here prevents the belt from riding from side to side across the pulleys . . . maintains straight belt movement.

Open mesh of the wire belt permits free, even heat circulation. All-metal construction gives longer belt life and lower maintenance costs.

Cambridge Chain Drive Attachment

Whether you're processing textile fibres, foods, chemicals, metal or ceramic products, a Cambridge woven wire conveyor belt can help you cut production costs and maintain product uniformity by combining movement with processing. But don't have the wool pulled over your eyes on conveyor belt design . . . be sure to call in your Cambridge field engineer for his recommendation on the proper—

CAMBRIDGE WOVEN WIRE CONVEYOR BELT —any metal or alloy, mesh or weave.

Write direct or look under "Belting-Mechanical" in your classified telephone directory.

FREE BELT MANUAL contains information on conveyor and belt design and specifications, metallurgical data and belt maintenance. Write for your copy today.

The Cambridge Wire Cloth Co.

Dept. G • Cambridge 1, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

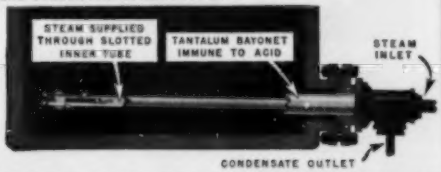
OFFICES IN PRINCIPAL INDUSTRIAL CITIES

a $4,000,000 Process...

dependent on a $300 heater!

Any number of elaborate and expensive processes can be cited where the success of the process depends upon the continuity of performance of a single heat exchanger unit. If the unit is shut down, the process is shut down. That is why Tantalum Heaters are so important where acid corrosion is involved.

Installation of Fansteel Tantalum Bayonet Heaters is made through side or bottom openings in vessels. With the heater entirely submerged, the total area of the tantalum bayonet is an active heating surface.



FANSTEEL ACID-PROOF TANTALUM BAYONET HEATERS

USE TANTALUM WITH ECONOMY for most acid solutions, corrosive gases or vapors; not with HF, alkalis or substances containing free SO_3.

Write for informative bulletins on Tantalum Acid-Proof Chemical Plant Equipment.

Tantalum combines the physical properties of steel with the chemical properties of glass . . . the results, speed in heat transfer, acid-proof—for most acid solutions and corrosive gases or vapors, and freedom from thermal shock. Fansteel Tantalum Heaters heat faster—save time, fuel and space—have a long life expectancy—give freedom from product contamination due to corroded equipment.

For consultation on any corrosion or heat transfer problem where Tantalum can be economically used to your advantage, consult Fansteel engineers . . . they are at your service. Fansteel Metallurgical Corporation, North Chicago, Illinois, U. S. A.

AN INDUSTRY THAT SERVES INDUSTRIES

Fansteel 12403-C

Acid Proof

TANTALUM

CHEMICAL PLANT EQUIPMENT

SITUATION WANTED

Versatile RED DIAMOND CO_2 Can Do Many Industrial Jobs Better: As a Refrigerant, As a Chemical Reagent, As an Inert Gas, As a Pressure Medium. Mail Coupon For Full Facts.

Red Diamond CO_2

Purity You Can Count On!

In your own plant there are probably several operations where "Red Diamond" CO_2 can serve you profitably. You may have overlooked these possibilities or perhaps you just haven't realized the great versatility of Red Diamond CO_2. We would welcome a discussion of your plant operations, perhaps we can show you a way to save with Red Diamond CO_2. Let's get together . . . mail the coupon today.

LIQUID ALSO PRODUCES oxygen, acetylene and other industrial gases.

CO_2 in all its forms by Diamond

GAS • LIQUID • SOLID (DRY ICE)

WORLD'S LARGEST PRODUCERS OF CO_2

A National Network of Service

Please have one of your engineers see us to discuss applications of Red Diamond CO_2.

THE LIQUID CARBONIC CORPORATION
135 East 44th Street, New York 17, N. Y.

*Individual*_____

*Firm Name*_____

*Street Address*_____ *City*_____ *State*_____

WORKS WHERE OTHERS WON'T

for SUBMERGED OILLESS BEARINGS

SPECIFY GRAPHALLOY WITH CONFIDENCE

- OPERATE DRY or SUBMERGED IN DYES, PLATING, CLEANING & CHEMICAL SOLUTIONS, GASOLINE, FOODSTUFFS
- TRULY OILLESS AND SELF-LUBRICATING
- EXTREMELY DURABLE
- CONSTANT COEFFICIENT OF FRICTION
- APPLICABLE OVER A WIDE TEMPERATURE RANGE—even where oil solidifies or carbonizes
- EXTENSIVELY USED IN CONVEYORS, PUMPS & OVENS
- ROTATING SEALS OF GRAPHALLOY ARE UNEXCELLED

GRAPHITE METALLIZING CORPORATION

1024 NEPPERHAN AVENUE, YONKERS 3, NEW YORK

You Get Even, No Glare

LOW COST LIGHTING

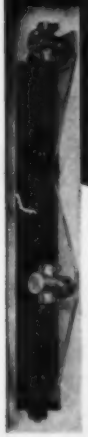
for Gages, Rotameters, etc.

with

JERGUSON

Explosion-Proof

GAGE ILLUMINATORS



Single and Double Section Jerguson Illuminators on a 3-Section Gage.

UNDERWRITERS' LABORATORIES APPROVED

YOU get even, no glare, Low Cost Lighting with Jerguson Gage Illuminators . . . the improved illuminators that are unexcelled for gages, rotameters, etc. They give you ideal illumination with safety . . . and make possible faster, easier, accurate reading.

Jerguson Illuminators use the principle of solid wedge lighting to give you *clear, even lighting, without bright spots.* Light flows through the plastic wedge and is reflected evenly. A single small bulb gives you better illumination at a cost so low that savings quickly pay for the illuminator.

Jerguson Illuminators are approved by Underwriters' Laboratories and are built in accordance with their Standard for Electric Lighting Fixtures for use in hazardous locations for Class 1, Group D Services. Made in a variety of sizes; also available in a non-explosion proof model.

Investigate Today. Write for Data Unit on Jerguson Illuminators

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY

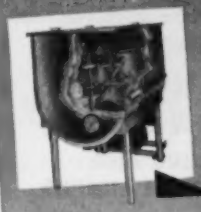
100 Fellsway, Somerville 45, Mass.

Representatives in Major Cities

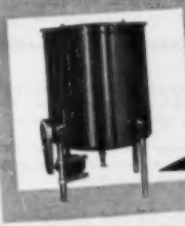
Please Listed Under **JERGUSON**

Jerguson Trees Gage & Valve Co. Ltd., London, Eng.

SAN-I-TANKS *give you capacities beyond gallons*



In Chemical Processing a stainless steel tank should have capacities beside those measured in gallons. Every standard SAN-I-TANK through Metal Glass "custom-design" engineering can be made to do one special job or adapted to combine several operations . . . for greater JOB CAPACITY that cut costs and speed production. Here are two of the many adaptable SAN-I-TANKS.



Type "CHR": Jacketed, insulated, stainless steel. Suited to all types of hot or cold, light or heavy processing. Wiping action of agitator arms prevents materials from lumping or adhering to tank sides. Standard capacities: 150, 300, 500, 1000 gallons. Write for Bulletin CHR-50.

Type "CJ": An open top, jacketed, stainless steel tank for every kind of hot and cold processing. Jackets for working pressure up to 150 p.s.i. Can be equipped with side, bottom or top-entering agitators and all types of fittings and connections. Capacities: 60 to 1000 gallons. Write for Bulletin JS-56.

STAINLESS STEEL SAN-I-TANKS

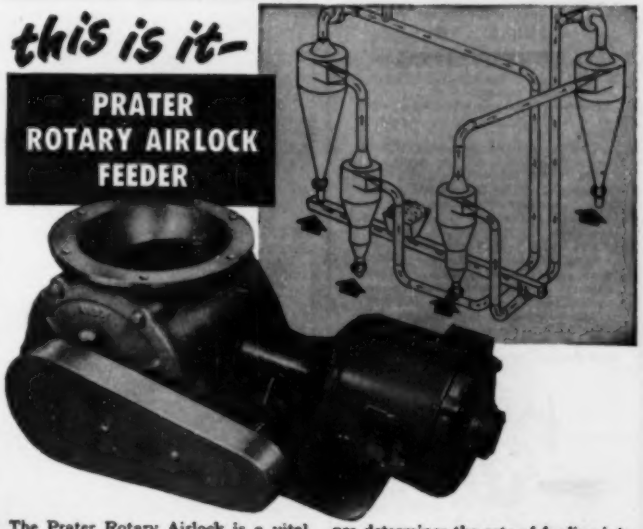
METAL GLASS PRODUCTS COMPANY

BELDING 5, MICHIGAN

New York Chicago Atlanta San Francisco Los Angeles Seattle New Orleans

this is it—

PRATER ROTARY AIRLOCK FEEDER



The Prater Rotary Airlock is a vital link in today's most efficient processing systems. This advanced-designed, precision built airlock speeds the feeding of powdered and granular products into the conveying line . . . and at the same time eliminates air leakage at the discharge of pneumatic equipment. It also pre-determines the rate of feeding into mixers, blenders, hoppers, etc. Made in ½ and ⅓ horsepower models. Write for full details at once.

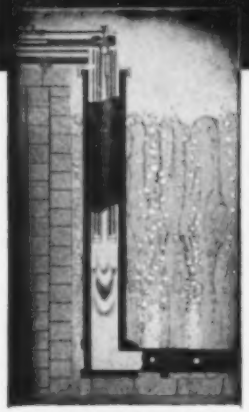
PRATER PULVERIZER COMPANY

1317 So. 55th Court, Chicago 50, Ill.

PRATER

Submerged Combustion

DIRECT FIRED GAS BURNERS



Exposed view Submerged Combustion Burner as now used to concentrate calcium chloride solution and ferric chloride.

A NEW METHOD FOR
HEATING and EVAPORATING
CORROSIVE AND NON-CORROSIVE LIQUIDS

★ Flame burns below surface, bringing liquid quickly to heat.

★ Hot exhaust gases forced through liquid carry away moisture.

★ Provides rapid evaporation and concentration of acids, salt solutions, suspensions. Also adapted to heating water and solutions.

★ Installed in any type tank. No boiler room required. Use any type gas—natural or manufactured. Automatic in operation.

Free *Send for descriptive circular No. 52 and details*

SUBMERGED COMBUSTION CO.
OF AMERICA, INC.
759 LOGAN STREET HAMMOND, IND.

THERE'S A MONARCH NOZZLE FOR EVERY SPRAY JOB

Remember—if the liquid can be sprayed with direct pressure Monarch can furnish the Nozzles.

Fig. F80

In many industries Monarch Spray Nozzles are used for:

ACID CHAMBERS
AIR WASHING
CHEMICAL PROCESSING
COOLING PONDS
DESUPERHEATING
GAS SCRUBBING
HUMIDIFYING
OIL BURNERS
SPRAY DRYING

Catalogs 6 A and 6 C Sent on Request

Monarch Mfg. Wks., Inc.
2513 E. ONTARIO STREET
PHILADELPHIA 34, PA.

DOUBLE BARREL ADVERTISING

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

Direct Mail supplements your Display Advertising. It pin-points your message right to the executive you want to reach —the person who buys or influences the purchases.

In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low overall cost and the tested effectiveness of these hand-picked selections.

for Results

Mc GRAW-HILL
DIRECT MAIL LIST SERVICE

McGraw-Hill Publishing Co., Inc.
330 West 42nd St., New York 18, N. Y.

☆ ☆ ☆

BUY U.S. SECURITY BONDS NOW!

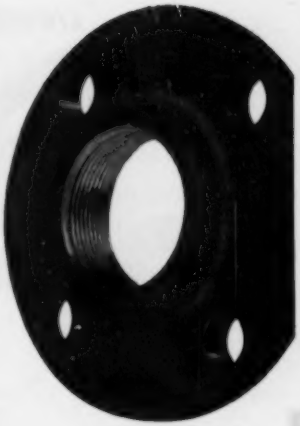
☆ ☆ ☆

PIPING
FOR THE
TOUGH JOBS

If your plans call for piping that must withstand the most difficult pressure, temperature, or corrosion conditions, you can rely on our experienced specialists to save you time and money. For more than fifty years we have been prefabricating and installing piping for the nation's leading utilities and process plants, and we pioneered in methods for welding stainless. Regardless of the size of your next project, send us your drawings for an estimate—you'll be glad you did.

INDEPENDENT FABRICATORS AND ERECTORS

WESTPORT JOINT
W. K. MITCHELL & CO., INC.
2948 ELLSWORTH STREET
PHILADELPHIA 46, PA.
MITCHELL



depend on CAMCO
rugged
long-lasting
stainless steel pipe fittings
to solve your
corrosion problems

All screwed Caps, Couplings, Plugs, Bushings and Unions up to and including 2" I.P.S. are machined from solid bar stock.

These fittings — sold at same price as competing 150 lb. cast fittings — can be used where working pressures of up to 1000 lbs. are experienced.

These stainless steel fittings are available in Types 304, 316 and 347.

Write TODAY for the 1951 Camco catalog and price schedules!

CAMCO PRODUCTS

Camco Products
25 Fox Street
New Haven 13, Conn.

Please send your latest catalog.

Firm_____
Street_____
City and State_____
By_____

MODERN TIME AND COST SAVERS BUILT BY...

Standard GRAVITY & POWER CONVEYORS

Save Time Loading — UNLOADING with the EXTENDOVEYOR

This compact, mobile, easily maneuverable power-belt conveyor unit extends to 46' in either direction and retracts to 9' 10". Reaches into cars, trucks, trailers. Handles boxes, bags, bundles, cartons, crates, cases weighing up to 150 lbs. Available in two models — 1 way stretch and 2 way stretch — and 4 sizes. Write for Extendoveyor Bulletin — address Dept. CM-12.

HANDIDRIVE Belt and Live ROLLER Conveyor UNITS

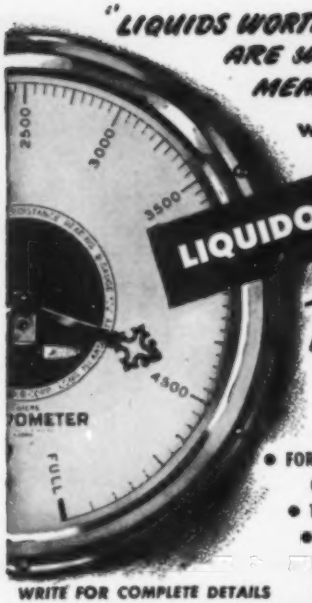
These standardized units can be used as extensions to present conveyors, as individual conveyor units, or to build a complete flow system of belt, line roller, and gravity conveyors. The Handidrive "package" consists of drive and takeup units, end roller assemblies, intermediate framework, supports and hangar — everything needed to make complete conveyors. Flexible and adaptable to many needs.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minnesota
Sales and Service in Principal Cities

Write for Bulletin 63-B, address Dept. CM-12

"LIQUIDS WORTH STORING ARE WORTH MEASURING" with a

LIQUIDOMETER Tank Gauge



- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

WRITE FOR COMPLETE DETAILS

THE LIQUIDOMETER CORP.
36-29 SKILLMAN AVE., LONG ISLAND CITY 1, N.Y.

NEW Sier-Bath
External Gear & Bearing Bracket Type
SCREW PUMP

FOR non-lubricating fluids, semi-fluids. Capacities: 1-700 GPM; Discharge: 1000 PSI for viscous liquids, 500 PSI for water.

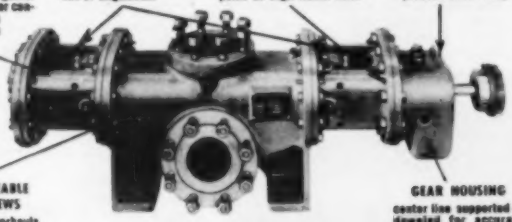
The Only Pump with All These Advanced Features!

THRUST BEARINGS
for less wear on bearings and timing gears. Double-row angular contact ball bearings position rotors axially.

RUGGED BRACKETS
won't twist rotors out of alignment.

ROLLER BEARINGS
where they're needed — at point of high radial load.

RIGID BEARINGS
outboard of timing gears — prevent shaft "whip."



INTERCHANGEABLE ROTOR SCREWS
make major overhauls simple, inexpensive — greatly reduce need (and expense) of periodic pump replacement.

SINGLE-POINT ALIGNMENT
speeds servicing — eliminates rotor distortion during installation, or when handling hot material.

GEAR HOUSING
center line supported — skewed for accurate alignment. Faster assembly — all parts automatically positioned by shoulders, locknuts.

For Further Information, See Your Local Sier-Bath Representative, Or Write To...

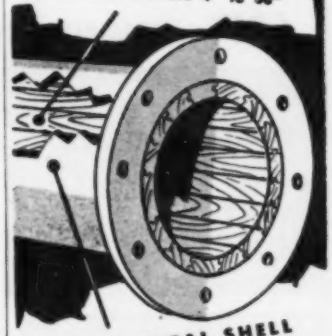
Also Makers of Sier-Bath Gearex Pumps, Precision Gears and Flexible Gear Couplings

Sier-Bath GEAR and PUMP CO., Inc.
9259 HUDSON BLVD., NORTH BERGEN, N. J.

if your piping problem is
✓ corrosion
✓ abrasion
✓ frictional resistance
✓ sliming
specify mpc
WOOD-LINED PIPE

Combines the strength of steel with the durability of wood. Ideal for corrosive liquids and gases including aggressive waters, industrial waste liquors, acid, alkali and salt solutions for service up to 180° F and 250 p.s.i. Higher pressure ratings for special service requirements. All pipe flanged and available in 10' and 20' standard lengths or "tailor-made" to your specifications. Easy to cut and re-flange. All flanges have standard ASME bolt circle.

INNER WOOD LINING
Internal diameters 4" to 36"



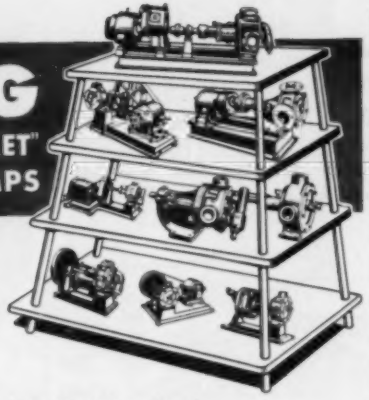
OUTER METAL SHELL
Wall thicknesses ¼" to ⅜"

Wood-lined fittings in standard and special designs for all diameters.
For catalog and additional information, write Dept. CE

mpc
MICHIGAN PIPE COMPANY

VIKING

THE "SUPER-MARKET" in ROTARY PUMPS



The range in size and style of Viking pumps truly parallels the range of items found in today's supermarket.

When you specify Viking, there is no compromise. They fit the job at hand. Nowhere else can this *complete line of rotary pumps* be duplicated. When your needs must be fully met, consult Viking for the answer. To start, ask for Folder 52SC today.

VIKING
AN HONORED NAME IN PUMPING

See Our Catalog in SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

for
• SPRAYING • WASHING • RINSING • COOLING • AIR CONDITIONING

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. Write for Bulletin N-616.

YARWAY SPRAY NOZZLES

YARNALL-WARING COMPANY
137 Mermaid Avenue, Philadelphia 18, Pa.

It's easier! quicker!

to select the RIGHT MATERIAL for your purpose

- What is it?
- What are its properties and uses?
- How does it compare with similar materials?

This book tells you!—saves you endless time—eliminates error—in looking up and choosing materials for manufacturing, construction, engineering, chemical processing, etc. Years of work have gone into selecting only the most pertinent facts about 8814 materials, and presenting them in simple, compact form.

An Encyclopedia for
PURCHASING AGENTS
ENGINEERS
EXECUTIVES
DESIGNERS

New 7th Edition

MATERIALS HANDBOOK

By GEORGE S. BRADY
879 pages, 6x9, 8.50

Use this handbook for preliminary survey when you need materials. Easy to consult, written as non-technically as feasible. Gives the most helpful facts on kinds, characteristics, comparative data, sources, substitutes, adulterants, and uses for thousands of natural and synthetic materials.

REVIEWERS SAY:

"The Materials Handbook is an old friend . . . In the Seventh Edition many of the items have been improved by pruning old outdated material or by grafting on new information."
—*Chemical Engineering*

"Supplies a wealth of facts and figures to simplify the estimating, specifying, and purchasing functions in product manufacturing and processing."
—*Modern Machine Shop*

"Engineers at a loss for information on the right material for the job they have in mind will find 'Materials Handbook' a big help."
—*Mill and Factory*

COVERS
8814 MATERIALS
in such groups as

Abrasives
Aircraft Metals
Bearing Metals
Brasses, Bronzes
Building Materials
Corrosion-resistant Alloys
Cupro-nickel Alloys
Fabrics, Leathers, Organic Materials
Fibers
Finishing Materials, Pigments, Solvents
Foundry Materials
Heat-treating Materials
Industrial and Plating Chemicals
Iron and Iron Alloys
Light Metals and Alloys
Lubricants, Oils, Greases
Metal Groups
Minerals
Molding Materials, Resins, Gums, Waxes
Ores of the Metals
Refractories, Heat Insulators
Steels and Tool Materials
Woods
White Metals

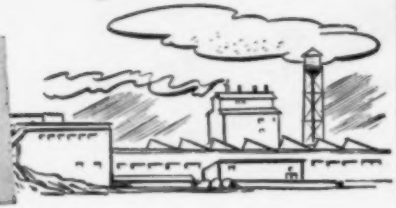
SEE THIS BOOK 10 DAYS FREE

McGraw-Hill Book Co., 330 W. 42nd St., NYC 36
Send me Seventh Edition, Brady's MATERIALS HANDBOOK for 10 days' examination on approval. In 10 days I will remit $8.50, plus a few cents for delivery, or return book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

(Print)
Name .....
Address .....
City .....Zone.....State.....
Company .....
Position CE-1
This offer applies to U. S. only

GAS WORKS...

TEXTILE MILLS...



CHECK CORROSION FROM ACIDS AND ALKALIES LONGER WITH

Gas works . . . constantly exposed to corrosive fumes as well as weather, find the protection of rubber-base paints an important contribution to lower maintenance costs. Similarly, the textile industry uses rubber-base paints extensively because these paints resist acids and alkalies alike—help protect metal and concrete surfaces as well as equipment.

Continuing tests indicate that rubber-base paints will resist common causes of corrosion three to four times longer than ordinary protective coatings. Exceptionally satisfactory service results are obtained in numerous industries where surfaces are attacked by acids, alkalies, and salts.

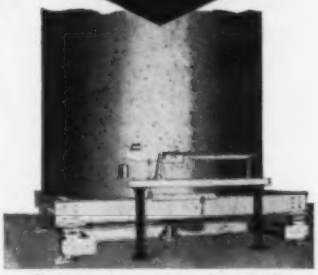
Rubber-base paints dry fast and are easy to apply. They are especially durable on concrete because they resist abrasion and the free alkali in cements. Ask your paint supplier for details or write:

HERCULES POWDER COMPANY
Cellulose Products Department
952 Market Street, Wilmington, Delaware

RUBBER-BASE (PARLON)® PAINTS

CR51-3

FOR WEIGHING CONTENTS OF TANKS and HOPPERS



Manufactured to special size—for your tank or hopper—vertical or horizontal

WINSLOW 150,000 LB. TANK SCALE

Can be furnished for use with cone shape or flat bottom tanks—with either direct reading weigh beam or ticket printing weigh beam. Ticket printing beam prints weights with 5 lb. or 10 lb. minimum graduation.

TYPE "A" RECORDING BEAM

This weighing equipment is in use by large and small industrial plants—throughout the United States—and specified by some of the country's largest consulting and construction engineering concerns.
Write for further information.

Winslow—
tank scales
Manufactured by
WINSLOW SCALE COMPANY
No. 35th Street • Terre Haute, Indiana

. . . NEW Heat Saving Efficiency

MUNDET 85% MAGNESIA INSULATION provides maximum strength and resistance to vibration. Extra durability is built into this insulation. In pipe covering and blocks, it is precision manufactured on the latest type of automatic equipment to insure uniform standards. It does not "powder", settle or disintegrate. It is unaffected by steam or water leakage. It maintains an attractive, smooth finish. Precision pipe fit is assured, with no spaces left for the escape of heat. You benefit from the most modern manufacturing facilities for the production of heat insulation when you specify Mundet 85% Magnesia Pipe Covering and Blocks.

Mundet Cork Corporation

Insulation Division, 7111 Tonnelle Ave., North Bergen, N. J.

Mundet district offices are located in these cities:

ATLANTA, 329-41 Elizabeth St., N.E.
BALTIMORE 30, 612 Battery Ave.
BOSTON, 57 Bogust St., N. Cambridge 40
CHARLOTTE 3, N. C., 307 S. Cedar St.
CINCINNATI 2, 427 West 4th St.
DALLAS 10, 401 Second Ave.
DETROIT 22, 14401 Prairie Ave.
HOUSTON 1, Commerce and Palmer Sts.
INDIANAPOLIS 4, 13 E. Washington St.
In Canada: Mundet Cork & Insulation, Ltd., 35 South Ave., Toronto
JACKSONVILLE 6, FLA., 800 E. Bay St.
KANSAS CITY 7, MO., 3401 St. Louis Ave.
KNOXVILLE, 1221 Grand Ave.
LOS ANGELES (Maywood), 6116 Walker Ave.
NEW ORLEANS 16, 315-25 N. Front St.
NEW YORK 17, 331 Madison Ave.
PHILADELPHIA 39, 816 N. 48th St.
ST. LOUIS 9, 3176 Bremen Ave.
SAN FRANCISCO 7, 440 Brannan St.

INSULATION FOR HIGH & LOW TEMPERATURE

NEW BOOKS

ENERGY SOURCES

Presents a detailed review of the size of fuel supplies, the factors that affect their rate of depletion, what sources may supplement them, and what may eventually succeed them. Everything from fossil fuels and hydroelectric power generation—to nuclear and solar energy is discussed in a highly readable manner. Comparisons are set up among all the important sources of energy, and definite programs are proposed for future developments. The book is based on an intensive survey undertaken at the request of the American Petroleum Institute. By **Eugene Ayres**, Gulf Research and Development Co., and **Charles A. Scarlott**, Editor, Westinghouse Engineer. 344 pages, 114 illus., over 60 tables. $5.00

GRAPHIC AIDS IN ENGINEERING COMPUTATION

Covers graphical and mechanical methods of computation. Treats the standard slide rules—the derivation of empirical equations from engineering data—the construction of nomographs by geometric methods and with determinants—the construction of special slide rules—and movable scale charts. Includes recent developments in nomography. By **Randolph P. Hoelscher**, U. of Ill., **Joseph N. Arnold**, Purdue U., and **Stanley M. Pierce**, U. of Ill. 197 pages, 115 illus., $4.50

THE THEORY OF ISOTOPE SEPARATION

Gives the first connected account of "cascade" separation theories—theories that may be applied to any of the six statistical methods of separation: 1. diffusion; 2. distillation; 3. centrifugation; 4. thermal diffusion; 5. exchange reactions; 6. electrolysis. Volume I in the "Special Separations Project" of the National Nuclear Energy Series. By **Karl Cohen**, formerly with the S.A.M. Laboratories, Columbia University. 360 pages, 52 illus., $2.00

PHYSICAL PROPERTIES AND ANALYSIS OF HEAVY WATER

Discusses the physical properties of heavy water, the equilibrium constants for exchange reactions. Covers isotopic analysis by the mass spectrometer, with application to heavy water; and other methods of analysis. Inquires into reported isotope variations in nature. Volume 4A in the "Special Separations Project" of the National Nuclear Energy Series. By **Isidor Kirshenbaum**, Exec Laboratories; **Harold C. Urey**, U. of Chicago; and **George M. Murphy**, N.Y.U. 438 pages, 140 illus.; tables and charts. $5.25

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., 330 W. 42 St., NYC 36

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery and return unwanted book(s) postpaid.

- ☐ Ayres & Scarlott—Energy Sources.....$5.00
- ☐ Hoelscher et al—Graphic Aids in Eng.....$4.50
- ☐ Cohen—Isotope Separation.....$2.00
- ☐ Kirshenbaum et al—Heavy Water.....$5.25

(print)
Name.....
Address.....
City.....Zone....State.....
Company.....
Position.....CE-1

This offer applies to U. S. only.

NIAGARA AERO HEAT EXCHANGERS give sustained full capacity in cooling and condensing with no dependence on cooling water... eliminating the problems of water supply, availability, temperature, or quality.

Niagara Aero Heat Exchangers at a Plant of the Hayden Chemical Corp.

Still Operations Improved by a New Cooling Method

• NIAGARA AERO HEAT EXCHANGERS *cool the reflux supply or condense vapors at a vacuum by controlled evaporation of water directly on the heat exchange surfaces.*

Liquid or vapor temperatures are always held constant by the Niagara "Balanced Wet Bulb" control method, which automatically varies the cooling effect proportionately to the load. The distillation is therefore uniform throughout all changes in climatic conditions the year around; it is the same in the heat of summer as in the freezing cold of winter. Continuous maximum production is thus insured.

Non-condensibles are effectively separated at the condensate outlet, with notable sub-cooling after separation for greater vacuum pump efficiency.

Use of Niagara Aero Heat Exchangers reduces your operating costs and removes many sources of your troubles in distillation column operation. Ask for new bulletin #120.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. CE, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in all Principal Cities of U. S. and Canada

Rietz

specializes

IN SIZE REDUCTION

Rietz **Disintegrators**

For fine or coarse grinding, pulverizing, pulping. 360° screen in wide variety of sizes. Patented differential discharge.

Rietz **Prebreakers**

for preliminary size reduction operations requiring crushing and breaking of tough materials. *Rietz* BLOCKBUSTERS are used for frozen meat blocks.

Rietz **Thermascrews**

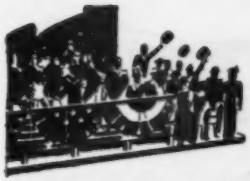
TL COOKERS: continuous screw-conveyor steam blanchers. TJ HEAT EXCHANGERS for heating or cooling; batch or continuous.

Equipment for the food and chemical process industries

Rietz

MANUFACTURING CO.

Santa Rosa, California



HERE'S A

Parade

YOU WON'T WANT TO MISS...

Everybody loves a parade but here's one that's particularly interesting to YOU because it's packed with "pocket-book" appeal. It's a never-ending parade of products and services designed to help you do *your* job better, quicker and cheaper. You're in the "reviewing stand" for this parade because it comes to you in the advertising pages of every issue of this magazine. Alert manufacturers use these advertising pages to get the *news* about their products and services to you... quickly and effectively. To be well-informed about the latest developments in *your* industry... and to stay well-informed... *read all the ads too.*

McGRAW-HILL PUBLICATIONS

A. E. STALEY MFG. CO. FINDS ANSWER to

Starch Conveying Problem

with SPROUT-WALDRON PNEU-VAC SYSTEM

PROBLEM: To convey starch products from spray chamber to packing area. Capacity required—2000 lbs./hr. Products are hygroscopic, tend to pack and lump when exposed to high humidity air. The conveying system is used for several different products; must be self-cleaning to avoid hold-up.

OPERATION: Dried products are discharged from drying chamber through rotary feeder valves to a 4" stainless steel Pneu-Vac pipe line. The Pneu-Vac elevates material to cyclone collector which feeds scalping screen at packing station.

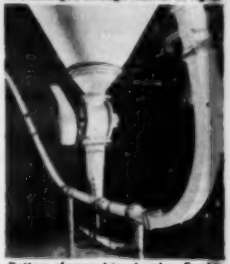
Conveyor air is filtered, dehumidified by cooling, then reheated to obtain necessary low relative humidity. Operational control of the entire system is completely automatic.

Dust which escapes the cyclone collector returns to the primary drying chamber.

RESULTS: Continuous removal of product from drier chamber is accomplished without danger of foreign matter contamination, or mixing of various products. Stainless steel construction insures product cleanliness. Loss of hygroscopic materials due to packing or sticking to conveyor surfaces is eliminated.

If you have a bulk materials handling problem, talk it over with Sprout-Waldron. PNEU-VAC may prove to be the most efficient solution. Write today to Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.

Pneu-Vac pipe line at left conveys product to collector where it discharges by gravity through feeder valve to screening and packing station below. Clean air is discharged through muffler at right.



Bottom of spray drier chamber. Feeder valve discharges starch products to 4" stainless steel Pneu-Vac pipe line.

Product from collector drops to vibrating screen and then to packing bin, from which it is drawn off in drums and multi-wall bags. Pneu-Vac pipe line carrying product from drier to collector is shown in upper left.

LOOK TO SPROUT-WALDRON for BETTER PROCESSING EQUIPMENT

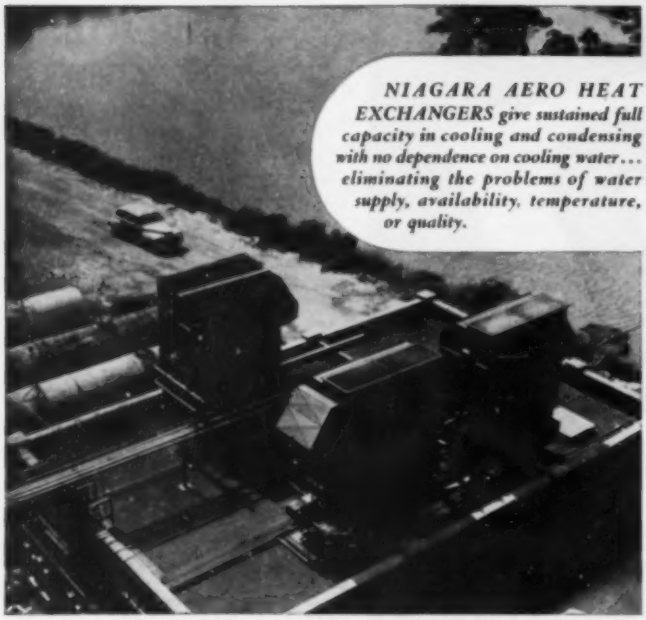
176

Sprout-Waldron

Manufacturing Engineers

SINCE 1846

MUNCY, PENNSYLVANIA



NIAGARA AERO HEAT EXCHANGERS give sustained full capacity in cooling and condensing with no dependence on cooling water... eliminating the problems of water supply, availability, temperature, or quality.

Niagara Aero Heat Exchangers at a Plant of the Heyden Chemical Corp.

Still Operations Improved by a New Cooling Method

• NIAGARA AERO HEAT EXCHANGERS cool the reflux supply or condense vapors at a vacuum by controlled evaporation of water directly on the heat exchange surfaces.

Liquid or vapor temperatures are always held constant by the Niagara "Balanced Wet Bulb" control method, which automatically varies the cooling effect proportionately to the load. The distillation is therefore uniform throughout all changes in climatic conditions the year around; it is the same in the heat of summer as in the freezing cold of winter. Continuous maximum production is thus insured.

Non-condensibles are effectively separated at the condensate outlet, with notable sub-cooling after separation for greater vacuum pump efficiency.

Use of Niagara Aero Heat Exchangers reduces your operating costs and removes many sources of your troubles in distillation column operation. Ask for new bulletin #120.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. CE, 405 Lexington Ave. **New York 17, N. Y.**

Experienced District Engineers in all Principal Cities of U. S. and Canada

Rietz

specializes

IN SIZE REDUCTION

Rietz **Disintegrators**

For fine or coarse grinding, pulverizing, pulping. 360° screen in wide variety of sizes. Patented differential discharge.

Rietz **Prebreakers**

for preliminary size reduction operations requiring crushing and breaking of tough materials. *Rietz* BLOCKBUSTERS are used for frozen meat blocks.

Rietz **Thermascrews**

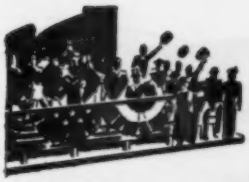
TL COOKERS: continuous screw-conveyor steam blanchers. TJ HEAT EXCHANGERS for heating or cooling; batch or continuous.

Equipment for the food and chemical process industries

Rietz

MANUFACTURING CO.

Santa Rosa, California



F-15A

HERE'S A

Parade

YOU WON'T WANT TO MISS...

Everybody loves a parade but here's one that's particularly interesting to YOU because it's packed with "pocket-book" appeal. It's a never-ending parade of products and services designed to help you do your job better, quicker and cheaper. You're in the "reviewing stand" for this parade because it comes to you in the advertising pages of every issue of this magazine. Alert manufacturers use these advertising pages to get the news about their products and services to you... quickly and effectively. To be well-informed about the latest developments in your industry... and to stay well-informed..., *read all the ads too.*

McGRAW-HILL PUBLICATIONS

A. E. STALEY MFG. CO. FINDS ANSWER to

Starch Conveying Problem

with

SPROUT-WALDRON PNEU-VAC SYSTEM

PROBLEM: To convey starch products from spray chamber to packing area. Capacity required—2000 lbs./hr. Products are hygroscopic, tend to pack and lump when exposed to high humidity air. The conveying system is used for several different products; must be self-cleaning to avoid hold-up.

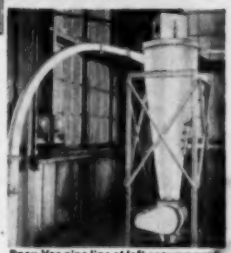
OPERATION: Dried products are discharged from drying chamber through rotary feeder valves to a 4" stainless steel Pneu-Vac pipe line. The Pneu-Vac elevates material to cyclone collector which feeds scalping screen at packing station.

Conveyor air is filtered, dehumidified by cooling, then reheated to obtain necessary low relative humidity. Operational control of the entire system is completely automatic.

Dust which escapes the cyclone collector returns to the primary drying chamber.

RESULTS: Continuous removal of product from drier chamber is accomplished without danger of foreign matter contamination, or mixing of various products. Stainless steel construction insures product cleanliness. Loss of hygroscopic materials due to packing or sticking to conveyor surfaces is eliminated.

If you have a bulk materials handling problem, talk it over with Sprout-Waldron. PNEU-VAC may prove to be the most efficient solution. Write today to Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.



Pneu-Vac pipe line at left conveys product to collector where it discharges by gravity through feeder valve to screening and packing station below. Clean air is discharged through muffler at right.

Bottom of spray drier chamber. Feeder valve discharges starch products to 4" stainless steel Pneu-Vac pipe line.

Product from collector drops to vibrating screen and then to packing bin, from which it is drawn off in drums and multi-wall bags. Pneu-Vac pipe line carrying product from drier to collector is shown in upper left.

LOOK TO SPROUT-WALDRON for BETTER PROCESSING EQUIPMENT

176

Sprout-Waldron

Manufacturing Engineers

SINCE 1866

MUNCY, PENNSYLVANIA

Who said . . . chemical apportioning pumps had to be high priced?

Neptune apportioning pumps cost you less to buy because of simplified design and the use of fewer parts. They automatically feed boiler water conditioning chemicals against pressures up to 400 psi. pumping from 0 cc to 14 gph. Adjustable stroke for precision volume control. Time tested in hundreds of installations. Specialization insures highest quality at lowest cost. Write for bulletin. Neptune Pump Mfg. Co., 4912 N. 6th St., Philadelphia 20, Pa.

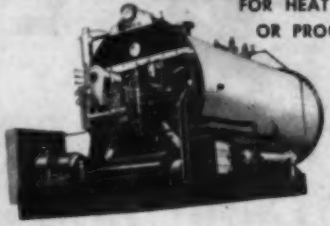
Simplex, duplex or dual operation

NEPTUNE *pumps*

for chemical apportioning

STEAM

FOR HEAT OR PROCESS



A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

SUPERIOR COMBUSTION INDUSTRIES, Inc.

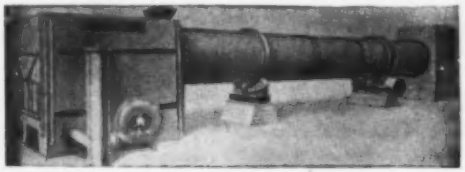
Factory: Emmaus, Pa.

Exec. Offices: Times Bldg, Times Sq., New York N. Y.

SUPERIOR STEAM GENERATORS

WHERE TO BUY

Featuring additional Equipment Materials, Supplies and Service for the Process Industries



DRYERS and KILNS . . .

For all purposes

W. P. HEINEKEN, Inc.

Engineer & Manufacturer

50 BROAD ST.

New York, N. Y.

FEED MATERIAL BY WEIGHT

THE MERRICK FEEDOWEIGHT

MERRICK SCALE MFG. CO.

171 SUMMER ST., PASSAIC, N. J.

CHEMSTEEL CONSTRUCTION COMPANY, INC.

501 Chemsteel Bldg., Walnut St., Pittsburgh 32, Pa.

Send data on Engineering & Construction facilities for ACID-ALKALI-PROOF CONSTRUCTION of processing & storage tanks & flooring.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....ZONE.....STATE.....

ACID TANK LININGS

• Applicators of B. F. Goodrich Rubber and Koroseal Linings, Metal Spraying, Synthetic Paints, AMERCOAT Plastic Coatings. Also, specialists in Welding, General Machine Work, Sandblasting.

• We are equipped to give you efficient service in the field or in our plant.

• Your inquiries are cordially invited. Request Corrosion Protection Bulletin.

METALWELD, INC.

2600 Hunting Park Ave., Phila. 29, Pa.

Make it a HABIT . . . to check this page —EACH ISSUE

This WHERE TO BUY Section supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation in the process industries.

PROFESSIONAL SERVICES

PATENTS · REPORTS · TESTING · PLANT DESIGN · INVESTIGATIONS · GENERAL CONSULTING · CHEMICAL AND BACTERIOLOGICAL ANALYSIS · RESEARCH · MANAGEMENT · TRANSLATIONS

R. S. ARIES & ASSOCIATES
Chemical Engineers & Economists
COMMERCIAL CHEMICAL DEVELOPMENT
Process Analysis • Market Research
Surveys—Technical and Economic
Design & Initial Operation of Complete Plants
Licensing of New Processes & Products
New Product Development
400 Madison Ave. EL-5-1430 New York 17, N. Y.

INTERNATIONAL ENGINEERING COMPANY INC.
Engineers
Investigations — Reports — Design
Procurement — Field Engineering
Domestic & Foreign
74 New Montgomery St. San Francisco 5, California

GUSTAVE T. REICH
Consulting Chemical Engineer
DEVELOPMENTS — OPERATION
CARBOHYDRATES INDUSTRY
BY-PRODUCTS
CARBON-DIOXIDE — WASTE DISPOSAL
Packard Building Philadelphia, Pa.

W. L. BADGER
CONSULTING CHEMICAL ENGINEER
Evaporation, Crystallization, and Heat Transfer; Complete plants for salt and caustic soda; Complete Dowtherm installations.
300 South State Street Ann Arbor, Mich.

GEORGE H. KENDALL
Consulting Mechanical Engineer
Cost Reduction Studies; Process or Product Redesign Existing Products for Greater Profit. Trouble Shooting Production, Design, Cost Problems. Specialist Automatic Machinery, Processes, Controls. New Developments, Patent Studies, Investigations. New Products & Process Engineering Studies
P. O. Box 3 *(Est. 1925)* Tel. Darien 5-1504
Norton Heights Darien, Connecticut

SANDERSON & PORTER
Engineers and Constructors
New York • Chicago • San Francisco

J. PAUL BISHOP AND ASSOCIATES
Consulting *Food and Chemical* *Engineers*
Specializing in:
Designing, Estimating and Engineering of New and Modernizing of Old Food and Chemical Plants and Processes.
Internationally Known.
Write P. O. Box 348
Champaign Illinois

KNOWLES ASSOCIATES
Chemical—Metallurgical—Mechanical Engineers
Consultation — Design
Complete Plants — Equipment.
Heavy Chemicals — Ore Dressing
19 Rector Street New York 6, New York
Bowling Green 9-8456

J. E. SIRRINE COMPANY
Engineers
Plant Design & Surveys covering Chemical, Electrochemical and Metallurgical Production; Trade Waste Disposal; Water Supply & Treatment; Analyses & Reports.
Greenville - - - - - - - - South Carolina

CARL DEMRICK
Technical Translations
Send for Circular
53 So. Broadway Yonkers, N. Y.

KOHN & PECHENICK
Consulting Chemical Engineers
Plants — Process — Equipment
DESIGN
Reports Trouble-Shooting Appraisals
262 Huron St. Brooklyn 22, N. Y.

MARCUS SITTENFIELD
Consulting Chemical Engineer
Plants - DESIGN - Equipment
Economic - SURVEYS - Technical
Process - DEVELOPMENT - Product
Registered Professional Engineer
1411 Walnut St. Philadelphia 2, Pa.

RICHARD F. ENNIS, JR.
Consulting Chemical Engineer
Engineering and Economic Studies
Design—Development—Research
Lincoln-Liberty Bldg. Philadelphia 7, Pa.

JACKSON D. LEONARD
Consulting Chemical Engineer
Cost Reduction Programs for the Process Industries
Maintenance Programs — Utility Conservation
Suggestion Systems — Cost & Economic Analysis
Process Design — Process Improvement
90 Spring Street Metuchen, N. J.

FOSTER D. SNELL, INC.
Research Chemists and Engineers
A staff of 75 including chemists, engineers, bacteriologists and medical personnel with 10 stories of laboratories and a pilot plant are available for the solution of your chemical and engineering problems.
Write today for Booklet No. 3
"The Chemical Consultant and Your Business"
29 West 15th St. New York 11, N. Y.

EVANS RESEARCH AND DEVELOPMENT CORPORATION
Organic and Inorganic Chemistry Processes—Products
250 East 43rd St. New York 17, N. Y.

C. L. MANTELL
Consulting Chemical Engineer
Process Research and Engineering
Development
457 Washington Street New York 13, N. Y.

NICOLAY TITLESTAD CORPORATION
Chemical Engineer
Design — Consultation — Complete Plants
sulphuric acid — phosphoric acid
nitric acid — oxidation of ammonia
nitrogen products — acid concentration
sulphur dioxide — carbon bisulphide
11 W. 42nd Street, N. Y. 18 PE-6-0010

FRASER-BRACE ENGINEERING CO., INC.
Design Engineers & Constructors
of
Hydro-electric Developments
Metallurgical, Explosives, & Industrial Plants
Chemical & Process Industries
Railroads — Tunnels — Port Facilities
10 East 40th St., New York 16, N. Y. Lex 2-5970

MELVIN NORD, DR. ENG. SCI., LL.B.
Consultant in Legal and Technical Problems
REGISTERED PROFESSIONAL ENGINEER
CHEMICAL ENGINEER
PATENT ATTORNEY
457 Washington Street New York 13, N. Y.

THE J. G. WHITE ENGINEERING CORPORATION
Design - Construction - Reports - Appraisals
80 Broad Street, New York 4

Knowledge plus Experience . . . always a vital asset—

When you are in need of expert advice to be applied to solving your particular problems, save TIME and COST by calling in a specialist.

These consultants have broad experience in management services that can be invaluable to you.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.
POSITION WANTED—INDIVIDUAL SELLING OPPORTUNITY undisplayed advertising rate is one-half of above rate, payable in advance.
PROPOSALS, $1.20 a line an insertion.

INFORMATION
BOX NUMBERS count as one line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style

DISPLAYED RATE:
The advertising rate is $11.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page. C. E.

NEW ADVERTISEMENTS received by 10 A.M. February 4th at the New York Office, 330 W. 42nd St., New York 18, N. Y., will appear in the February issue subject to limitations of space available

MECHANICAL ENGINEERS
WANTED

Graduate Engineer, age about 35, for responsible position in Product Engineering Department of prominent manufacturer of pressure vessels and related equipment for the chemical, dairy, food, and beverage industries. Design experience on similar equipment required.

Graduate Engineers, recent, for design work in Product Engineering Department.

Opportunities for advancement, and excellent program of employee benefits. Submit resume of experience to:

P-2814, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

Production Manager

Excellent opportunity for aggressive man to take charge of processing division in old line food company in Boston area. Prefer man experienced in chemical, food, confectionery, dairy or similar industries. Require industrial Engineering degree or experience, in addition to production supervision experience. Unlimited future for a creative thinker who is aggressive and has a sound knowledge of scientific management principles. Give full details including salary desired in first letter.

P-2819, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

Opportunities
FOR
Mechanical Engineers

We are seeking men interested in general plant engineering work including power, water, project, design and maintenance engineering. Up to 15 years experience in chemical or related industries desirable. Initial assignment Wilmington, Del. Subsequent reassignment to Eastern or Southern plant locations. Send Resumes to

GEORGE F. COOPER
Technical Employment Supervisor
Hercules Powder Co., Wilmington, Delaware

SALES ENGINEERS

One of our clients requires technical representatives for expanding sales force to sell fibrous and plastics materials and fabricated parts. Engineering graduates, age 28 to 35 preferred, with proven ability to build and maintain technical contacts. Men chosen will join long-established, progressive company. Commission and expenses, with good earnings possibilities. Open territories: Chicago area, New York State, excluding New York City; Philadelphia area, and Pittsburgh, Ohio, Kentucky territory. Submit complete resume, earnings record, references and photo promptly for personal interview in your city. All replies confidential. The Charles Brunelle Company, 15 Lewis St., Hartford 3, Conn.

WANTED FOR
CHEMICAL PLANT LOCATED IN SOUTH
ESTIMATORS

Must be experienced engineers, under 45, familiar with Refinery and Chemical Plant design and capable of estimating process equipment installations from flow diagrams and specifications. Give full information, experience record and salary expected in first letter. All replies confidential.

P-2908, Chemical Engineering
520 No. Michigan Ave., Chicago 11, Ill.

PRODUCTION SUPERVISION

Rapidly expanding, medium-size company engaged in chemical, rubber, and plastics operations has several production supervisory openings with excellent potential for advancement. Engineering degree necessary. Business Administration training and/or industrial experience desirable.

P-2108, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

MAN BETWEEN 30 and 40 years of age, technical training, some sales experience in alkali and chlorine industry, capable of eventually handling sales for growing young chemical manufacturing company. P-2912, Chemical Engineering.

OLD ESTABLISHED Midwest metal company entering ore and chemical products field desires services of well experienced and successful trader with large following in ores and chemicals. Good salary participation. Excellent opportunity for right party. Replies strictly confidential. RW-2891, Chemical Engineering, 520 No. Michigan Ave., Chicago, Ill.

PROJECT MANAGER'S Assistant—for office and field coordination, design and construction, process industry plants. Unusual opportunity in growing department of large and long-established construction firm. P-2874, Chemical Engineering.

WANTED: CHEMICAL Engineer with experience in developing new processes. Should have good background of creative work. Age 28-40. Man we are looking for is not only a capable engineer in his own right but also must have leadership ability necessary to supervise the work of other Chemical Engineers and development people. The job will consist of heading a development team. It is an excellent opportunity for the right man. Starting salary is about $6500.00 per year, depending upon background and experience. Good chance for advancement. P-2827, Chemical Engineering.

SELLING OPPORTUNITY OFFERED

SALES ENGINEER Wanted—Should be experienced in selling filter aids and industrial mineral fillers. Midwestern concern. Apply by letter giving experience to RW-2875, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $25,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 260 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service established 1937, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

Senior	ENGINEERS	Junior
Chem. Eng'r. Ph. D.		$12,000
Research dev. "new products div", client. An "idea" man.		
Chem. Eng'r, degree man		$8,500
Exp. in pharmaceut'ls essential.		

Call, write or wire: GLADYS HUNTING
BRAKE PERSONNEL
7 W. Madison St. Chicago 2, Ill.

POSITIONS WANTED

ANALYTICAL CHEMIST: Mature, versatile. Experienced, metals, ores, electroplating, silicates, organic. PW-2844, Chemical Engineering.

CHEMICAL ENGINEER, B.S., M.S. at V.P.I. Studying I.A.S. Cost Accounting. Reg. engr. W. Va. 28. Married. Family. Experience in ship construction, repair; bituminous coal production; industrial insurance; chemical development. Intelligent, aggressive. Desires responsible position with chemical company needing well-rounded engineer. Deep South preferred. PW-2832, Chemical Engineering.

CHEMICAL ENGINEER, Canadian, wishes position which will keep him up to his ears in work and offer ample opportunity for advancement; Graduate of Toronto 1944, married, two children, presently employed in business administrative capacity. PW-2826, Chemical Engineering.

CHEMICAL ENGINEER graduate, 1941, desires position with progressive company located in Indiana or surrounding states. Varied engineering experience. PW-2852, Chemical Engineering, 520 N. Michigan Ave., Chicago 11, Ill.

CONTRACT WORK

Custom Grinding—Well-established company in New Jersey offers facilities for fine grinding of metallics and non-metallics to flake, chip and grain forms. Specialists in hazardous products. Packing, mixing, and shipping facilities available. CWW-2418, Chemical Engineering.

PATENTS

CONSULT: Z. H. POLACHEK.
Reg. Patent Attorney, 1224 Broadway, New York 1, N. Y.

SALES REPRESENTATION WANTED

Sales engineering organization with established office and clientele in the chemical, process and power industries desires one additional major account on an exclusive basis in the Metropolitan New York-Northern New Jersey territory.

RA-2931, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

TO A FIRST CLASS FABRICATOR LOOKING AHEAD

An opportunity to manufacture a line of standard chemical and process equipment. We will provide design and engineering know-how, fabrication technique, merchandising program and N. Y.-N. J. sales representation.

CW-2963, Chemical Engineering
330 W 42nd Street, New York 36, New York

Don't forget
THE BOX NUMBER . . .

when answering the classified advertisements in this magazine. It's our only means of identifying the advertisement you are answering.

Business Opportunity Advertising—page 400

ENGINEERS

Chemical - Mechanical - Piping - Process

Long term openings in permanent offices located at Cleveland, Ohio and Frederick, Maryland offering good salary plus overtime (forty-eight hour week) for qualified Engineers, Group Leaders and Designers experienced in one or more of the following phases of industrial plant design:

PROCESS PIPING
INSTRUMENTATION
PROCESS EQUIPMENT LAYOUT
PACKAGING
AIR CONDITIONING
PLUMBING
TANKS AND VESSELS
BOILER HOUSES
PLANT LAYOUT
CONVEYORS
HEATING AND VENTILATION
SPRINKLERS
WATER TREATMENT

Limited number of openings for Estimators experienced in Mechanical and Chemical installations as well as building construction.
Also have a number of openings in our Cincinnati and New York City offices for similar type personnel.
Excellent working conditions with paid vacations, sick leave plan and participating Group Insurance Program.
Please submit complete resume stating experience, education, salary required and date available to:

The H. K. Ferguson Company
Engineers and Builders
Ferguson Building — Cleveland 14, Ohio

EDITORS WANTED

To expand its editorial services Chemical Week plans the addition to its New York staff of two assistant editors.

Qualifications desired:

(1) Graduate chemical engineer with 5 years experience in production, familiarity with chemical process equipment and process techniques, ability to write clearly and concisely.

(2) Graduate chemical engineer or chemist with 5 years experience in the chemical business—in sales or purchasing, but preferably in market research. In any case, a sound working knowledge of the industry is essential, as is the ability to write.

Please submit details—education, business experience, salary desired—by mail only to:

S. D. KIRKPATRICK *Editorial Director*
CHEMICAL WEEK
330 W. 42nd St. New York 18, N. Y.
Applications will be held in strictest confidence

ALBERTA

CANADIAN CHEMICALS COMPANY, LTD.

EDMONTON, ALBERTA, CANADA

Experienced Canadian Personnel Only

Chemical engineers for production supervisory positions in Petrochemical & Cellulose Acetate divisions

Experienced men for production supervisory positions in Yarn & Staple Fibre Division

Reply with personal background, education, experience, and salary expected. Personal interviews will be arranged.

All replies will be held confidential.

ADDRESS REPLIES TO
PERSONNEL SUPERINTENDENT
CELANESE CORPORATION OF AMERICA
BOX 148, BISHOP, TEXAS

WANTED

CHEMICAL ENGINEER

For development and operations in modern, expanding chemical manufacturing plant in Ohio Valley, West Virginia panhandle. Inorganic or Organic.

Two to three years experience preferred.

P-2736, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

CHEMIST or CHEMICAL ENGINEER

Some industrial experience required for an expanding Chemical Division in a plant located in Central New Jersey. Give brief, but complete background of experience, education and salary desired.

P-2714, Chemical Engineering
330 W. 42 St., New York, N. Y.

VISCOSE ENGINEER

National organization seeks capable graduate engineer with experience in viscose rayon manufacture or related experience. Headquarters New York. Salary open.

Send complete resume including age and salary data

Box CE 698, 221 W. 41 St. New York City 18, N. Y.

OPPORTUNITIES FOR EXPERIENCED TECHNICAL PERSONNEL

in

ATOMIC ENERGY INSTALLATIONS

Oak Ridge National Laboratory
Oak Ridge, Tennessee

Electromagnetic Separation Plant
Oak Ridge, Tennessee

Gaseous Diffusion Plants
Oak Ridge, Tennessee and Paducah, Kentucky

ENGINEERS

DESIGN-DRAFTING — chemical plants, structures, piping, valves, utilities, alterations.

LABORATORY — research and development.

POWER—design, testing, construction of large electrical power generation and distribution installations.

MACHINE DESIGN—jigs, fixtures, gadgets, remote control equipment.

PROCESS—chemical process and equipment design, vacuum or high-pressure systems, pilot plant and production operation.

CONSTRUCTION—plant design, specifications, sub-contractor liaison.

SAFETY—pressure vessel inspection and fire protection.

NUCLEAR REACTORS—design, development, construction, testing.

INSTRUMENTATION — design development and industrial application of electronic and pneumatic instruments.

INDUSTRIAL AIR-CONDITIONING AND REFRIGERATION — design of plant systems.

CHEMISTS, PHYSICISTS, METALLURGISTS

Research, development, and production in nuclear technology, gaseous diffusion, and related fields.

Minimum educational requirement—B.S. degree, or its equivalent.

Salary commensurate with training and experience

Give experience, education, age, references, personal history, salary received and salary expected.

Central Technical Personnel Office

CARBIDE and CARBON CHEMICALS COMPANY
a Division of
UNION CARBIDE AND CARBON CORPORATION
Post Office Box P
Oak Ridge, Tennessee

We Offer PRESSURE VESSELS

FOR SHIPMENT NOW

USED CONDITION
CODE CONSTRUCTION BY
A. O. SMITH CORP.

8—10' ID dia. x 40' tangent to tangent x 3" shell. Heads 3½". Test pressure—900 psi. WP—400 psi. All-weld.

8—10' ID dia. x 40' tangent to tangent x 2½" shell. Heads 3". Test Pressure—750 psi. WP—300 psi. All-weld.

3—8' ID dia. x 40' tangent to tangent x 1½" shell. Heads—1¼". Test pressure 575 psi. WP—300 psi. All-weld.

8—8' ID dia. x 40' tangent to tangent x 3" shell. Heads 2¼". Test Pressure 750 psi. WP—300 psi. All-weld.

All vessels located near Chicago, Illinois, and offered subject to prior sale.

Write—Wire or Phone

Howard Kinslow

Kinslow Power & Equipment, Inc.

817 So. Boulder Tulsa 14, Okla.

Phone 5-3914

DOWTHERM VAPORIZER

1,000,000 B.T.U.

FOR SALE

#33-3A McKee Gas Fired, receiving tank, condensers, coolers, Nikroloy Pump, interconnecting piping, valves and fittings.

THE O'BRIEN MACHINERY CO.
1555 No. Delaware Ave. Phila. 25, Pa.

PLANT FOR SALE

Newark, N. J. Three-story brick building 71,000 sq. ft. Brick garage 10,000 sq. ft. Buildings—sprinkler throughout—2 freight elevators—heating system—loading dock 185 ft.—yard 6,000 sq. ft. 3 steam engines @ 550 K.W., 110 V.D.C.—two Diesels 28 and 40 K.W.—Boiler #1 @ 750 BHP, Boiler #2 @ 900 BHP, 160 lb. rtd. cpty. each. Softest water in state, low taxes, plentiful local labor, easily accessible to varied communities. Only substantial inquiries invited.

BO-2771, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

Available — CUSTOM REFINING FACILITIES
- Distillation
- Extractions
- Separations
- Fractionation

Drum Lots—Tank Cars

Wanted
- All Types of Crude Mixtures
- By-Products, Residues, Wastes Contaminated Solvents

TRULAND CHEMICAL & ENGINEERING CO., INC.

Box 426, Union, N. J. UNionville 2-7360

WANTED

CHEMICAL PLANT WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALE, Sec.
250 Broadway, N. Y. 7, N. Y. BA 7-1919

WILL BUY

Cancelled - Unshipped - Rejected or Over-Stocked

CHEMICALS—DRUGS
SOLVENTS
PHARMACEUTICALS
OILS—PIGMENTS, ETC.

Chemical Service Corporation

80-04 Beaver St. New York 5, N. Y.

WANTED METAL-SCRAP

Buyers of

- Copper Scale
- Copper Oxides
- Copper Catalyst
- Copper Powders

OPELL METAL ASSOCIATES
1 E. 41 Street New York 17, N. Y.
MUrray Hill 3-3421-2-3

WANTED
USED VOTATOR

Please give complete description including price wanted in letter.

W-2769, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

At Your Service . . .

The Searchlight Section is at your service for bringing business needs or "opportunities" to the attention of men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industry served by this McGraw-Hill publication.

For You

MONEY WAITING FOR YOUR IDLE OR SURPLUS MACHINERY

We Need

• Immediately •

DRYERS, all types
FILTER PRESSES
MIXERS
PULVERIZERS
EVAPORATORS, STILLS
COLUMNS
ROLLER MILLS
SCREENS & SIFTERS
PACKAGING UNITS
REACTION KETTLES
JACKETED KETTLES
ROTARY FILTERS
STORAGE TANKAGE
HYDRAULIC PRESSES
FLAKERS
S/S TANKS & KETTLES

• *Send us you list*

Single items to complete plants

CONSOLIDATED PRODUCTS CO. INC.

15 Park Row New York 38, N. Y.
BArclay 7-0600

Don't Wait Until The Machinery You Want Is Sold

TAKE ADVANTAGE OF THESE HARD-TO-GET ITEMS

FILTERS & FILTER PRESSES

1—Sperry, iron, steam heated, 30" x 30", 30 chambers.

6—Shriver & Johnson 30 x 30 iron plate and frame, 35-40 chambers each.

1—36" Sperry C. I. FILTER PRESS, recessed, open delivery 60 chambers, 1½" cu., pump, explosion-proof motor.

1—8' x 12 ALL STAINLESS STEEL Feinc Rotary Continuous Vacuum Filter string discharge with blankets and STAINLESS STEEL trough repulper, receivers, vacuum pump, motors, reducters, etc. ETAO #387.

1—8' x 12 Oliver Lead-Wood Vacuum Filter Acid-Resisting.

3—Oliver Vacuum Filters, incl 8 x 12' 11'6 x 14' 11'8 x 18'.

2—ALUMINUM Sperry FILTER PRESSES: 1—30" x 30" 45 chambers. 1—24" x 24" Plate and Frame, 24 chambers.

1—#12 Sweetland Filter 36 leaves on 4" centers.

1—Kilby 30 x 30 CI Filter Press open delivery.

1—#5 Sweetland, Stainless Steel Lined with 30 stainless steel leaves on 2" centers.

1—Shriver 42" x 42" Filter Press with 50 plates and frames, corner feed; wash type; open delivery; with hydraulic closure.

JACKETED KETTLES

45—Aluminum & Stainless Steel 20 gal. to 150 gal.

1—500 gal. open agitated.

2—Lee 200 gal. S-S Kettles, 125#.

4—Burkhardt Copper, 275 gal.

1—Copper 500 gal. turbine agitated copper coils.

1—100 gal. and one 150 gal. Dopp small C. I. dbl. motion agitated.

1—10' dia. x 4' Bartlett and Snow 1800 gallon, with agitator, 9/16" plate, 90 lbs.

1—5,000 gal. steel, closed agit.

DRYERS

4—Atmospheric Truck Dryers, Brilsonair, each 6'6" x 16' x 8'3" high with Trane heating Units motor driven, blowers, etc.

1—3' x 26' MONEL shell hot air Dryer, saw tooth flights, steam coils, etc.

1—5'6" x 24' Direct Heat Rotary Dryer or Rotary Kiln, welded shell.

1—7' x 70' Louisville Type L, Indirect-Direct Heat Rotary Dryer.

1—10' x 90' Allis Chalmers Rotary Dryer or Cooler.

EVAPORATORS

1—Swenson triple effect Evaporator, horizontal copper tubes, total 1320 sq. ft. H.S. Now installed and complete with supporting steel condenser, pumps, piping, etc.

Also used as Finishing Pan—

1—Swenson single effect Evaporator, copper tubes, 440 sq. ft. H.S. with supporting steel condenser, pumps, piping, etc.

1—Devine #7 Vacuum Shelf Dryer, 13 shelves 40 x 43.

2—Buflovak Double Drum Dryers 32" x 90" complete with stainless steel accessories.

1—Devine Rotary Vacuum Dryer, 2' x 8', also 5' x 25'.

2—Buflovak Vacuum Drum Dryers, 5' x 10' with all accessories.

1—6 x 50 Louisville welded shell Rotary Steam Tube Dryer with two rows, 54 tubes. Also two 6' x 27' Davenport same type.

3—J. P. Devine Double Door Vacuum Shelf Dryers; each equipped with 17 heated welded shelves; pumps and condensers.

1—F. J. Stokes 14 shelf, 44" x 44" Vacuum Shelf Dryer with vacuum pump and condenser, etc.

2—5' x 40' Ruggles-Coles Direct Heat Rotary Dryers.

STAINLESS STEEL CENTRIFUGALS

2—42" All Stainless Steel Centrifugals, Amer. T&M Co. each with 5/8 basket, curb, casing, shaft unloader and 40 H.P. variable speed Slip Ring 3/80/440 V 1200 RPM motor with full controls. Suspended bottom discharge type. Now at Newark.

MIXERS

4—Baker Perkins, jack. Mixers, 3,000 gal., size 30, type X.

1—100 gal. jack. B.P. Mixer, heated blades.

1—50 gal. jacketed W. & P. Mixer, M.D.

1—Patterson 110 gal. S.S. Vacuum Kneadmaster.

1—Baker Perkins, size 8, 5 gallon working capacity, jacketed Laboratory Vacuum Mixer with Cleveland Reduction Drive and 5 HP, AC motor.

1—AMF 340 qt. Glen Mixer, 2 S-S Bowls and beaters, md—new 1949—practically new.

3—AMF 120 qt. Glen Mixers, 20 S-S 80 and 120 qt. bowls and beaters, md, new 1949—practically new.

1—McClellan 30" dia. 400 lb. copper lined mixer.

MISCELLANEOUS

400—Stainless Steel Dryer Trays, 24" x 34" x 1½" deep.

6—800 gal. Pfaudler Glass Lined Kettles with steam coils and supports.

1—Copper Rectifying Column, 6 sections, 30" dia. x 33' high, bubble cap type.

15—Dry Powder Mixers and Blenders, rotary and horizontal ribbon type, 100 to 5000 lb.

1—Capem, S.I.F. Capper, cup feeder, m.d.

4—All STAINLESS STEEL No. 7, Day "ROBALL" Sifters, 40" x 84".

4—Swenson-Walker, jacketed, Crystallizers.

1—Unused 4' x 8' KENNEDY BALL MILL, iron lined.

1—4'6" x 16" Hardinge Ball Mill, iron lined.

1—6" x 15" Sturtevant Jaw Crusher to ½".

1—30" x 16" Set Sturtevant Crushing Rolls, balanced type.

1—5-Roll Raymond High Side Pulverizer.

1—Gedge Gray 7,000# jacketed Powder Mixer.

1—Stokes DD2 Rotary Tablet Machine, Reeves drive and motors.

2—Paul O. Abbe 30 gallon Pebble Mills with gear reduction; V-belts and 1½ HP motors.

10—Trane 24" x 48" double coil heater units, copper, with eight exhausters, each with 5 HP motors.

Only a PARTIAL LIST — Lots more UNLISTED in our stocks

CONSOLIDATED PRODUCTS COMPANY, INC.

15 PARK ROW, NEW YORK 38, N. Y. BArclay 7-0600

Rebuilt For New Machine Accuracy

At Tremendous Price Reductions

UNION Rebuilt Machinery — Established 1912

International S. S. Straightline Vacuum Filler, 160 per minute.
Resina S and LC Automatic Cappers.
New Way MH Wraparound Labeler.
S. & S. G1, G2, HG88 Auger Fillers.
Colton 2 & 3 RP Rotary Tablet Machines.
Stokes 2C Cream Filler and Closer.
Triangle Package Elec-Tri-Pak, G2C, G2S, A2C, N2CA and A6CA Fillers.
Filler 4 Head S. S. Fillers.
Horix S. S. 14 head Rotary Filler.
Standard Knapp No. 429 Carton Sealer.
Mikro 4TH, 3TH, 2TH, 1SH Pulverizers; Jay Bee U1, Schutz O'Neill Mills.
Tri-Homo #6 S. S. Homogenizer, 7½ HP.

3500 gal. working cap. Steam-Jacketed, Double-Arm, Mixing Tanks for mixing, storing or processing of your materials.

B. P. 150 gal. Unidor S. J. D. A. Mixer.
Stokes, Day, New Era, Hottman Mixers, from 2 to 450 gals., with & without Jackets, Single, Double Arm Agitators.

Baker Perkins and Readco Heavy Duty 5-150 gallon Double Arm Jacketed Mixers with Sigma or Fish Tail B ades.
Ross, Day Pony Mixers, 8, 15 gal. caps.
Day, etc. 100-2500 lbs. Powder Mixers.
85-100-150 gal. Stainless Steel Jacketed and Mixing Kettles.
Huhn Steam and Gas Fired Rotary Dryers.
Kent and Lehman, etc. 3 Roll Mills, 12" x 30" and 16" x 40" sizes.
Allis Chalmers, Great Western Sifters.
J. H. Day 7' x 40" S. S. Single Deck Sifter.
Pony MX, ML, Auto. Duplex Labelrites; World Rotary, Straightaway Labelers.
Alsop, Sweetland, Shriver Filter Presses.
Pneumatic Scale Cartoning Line.
Miller, Scandia, Hayssen Wrappers.
Package Machy. Co. FA, FA2Q, FA4Q Wrappers.

Act Now For Choice Buys
Tell Us All Your Machinery Requirements

Immediate Deliveries

UNION STANDARD EQUIPMENT CO.
318-322 Lafayette Street New York 12, N. Y.

EMC

SAVE HALF on These DESIRABLE MACHINES
Ready to Ship from N. Y.

15 Hammer Mills and Pulverizers by Mikro, Robinson, Gruendler, Williams, Jay-Bee, Jeffrey, Raymond and others; from 3 H.P. to 150 H.P.

Buffalo 20 Shelf Vacuum Chamber Dryer.

2 Stainless Reactors; 24"x40" jacketed and insulated with agitators.

Pilot Plant with 250 Gal. Monel Reactor, S.S. Condenser and S.S. Receiver (print on request).

Pfaudler Glass Lined Pilot Plant with 18"x20" agitated Jacketed Reactor, Pfaudler Glass Lined Receiver, condenser and accessories.

Reactor of Type 316 Stainless; about 470 gal. with steel jacket, S.S. agitator with 5 H.P. motor.

2 Dopp Cast Iron 600 Gal. Jacketed, Agitated Reactors; 80"x67".

Struthers Wells Stainless Steel Heat Exchanger, 1000 sq. ft.

Raitz Model 18 Stainless Steel Disintegrator with 30 H.P. motor.

Lancaster, Model EAG4 Muller type Mixer with Hood, Loading Elevator, Dust Collector, 10 H.P. motor complete.

Send for Complete Bulletin

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

FRED R. FIRSTENBERG, Pres.

STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 3000 gallon capacity. Welded construction—Fully insulated. Equipped with manhead. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

TWO COMPARTMENT TANKS—USED—Hinged covers. 50" x 10' x 32" deep—3/16" Steel. 750 gallons. Suitable for cooking-mixing or storage.

VARNISH TANKS—USED—54" diameter x 14'6" high (or long) ¼" Steel — Welded construction—1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

ERMAN-HOWELL DIVISION
LURIA STEEL & TRADING CORP.
332 South Michigan Ave.
Chicago 4, Ill.
Telephone: Wabash 2-0250

TRADE WITH BAUER
BUY - SELL - TRADE your
COMPRESSOR
VACUUM PUMP STEAM BOOSTER
L.W.BAUER

Type Furnace V12-T.C.
HEROULT
ELECTRIC FURNACE

Capacity 20-25 Tons Per Heat.
Transformers Three 11,000 Volts
Shell (Furnace) 12' Diameter By 7½'

Primary Oil Circuit Breaker. 13,800 Volt rating Switch board, and Electrical Control Panel G.E. Balanced beam Type. Three masts, three sets of holders, and arms, and three electric motors.

A. B. REINERTSEN
3715 NE. Hassalo Portland 13, Ore.

AIR COMPRESSORS

2—245 CFM Chicago Pneu., Type NSW, Synch motor driven comps. single stage 10 x 10, 277 RPM, 100 lb. pre. Comp. with all acces.

4—Nash Hytor Vacuum Compressors #2, motor driven, 860 RPM, 240 CFM at 10".

PHILADELPHIA TRANSFORMER CO.
2829 Cedar Street Phila., Penna.

WATCH THESE CURVES IN 1952!!

- YOUR PRODUCTION CURVE . . .
- YOUR ECONOMY CURVE . . .
- YOUR PROFITS CURVE . . .

GELB

MACHINERY IS THE RIGHT ANSWER!

The Gelb Girl
January 1952

1—Niagara Model #200 Filter, Stainless Steel Leaves.

1—Shriver 24" x 24" Stainless Steel Jacketed Filter Press, 10 Chambers, Closed Delivery, 4 Eye, Washing Type.

2—Shriver 36" x 36" Cast Iron Plate & Frame Filter Presses, 24 Chambers, Open Delivery, Washing Type.

1—Shriver 42" x 42" Evedur Plate & Frame Filter Press, 40 Chambers, Closed Delivery.

1—Sperry Heresite Covered Filter Press, 36" x 36", 4 Eye, Closed Delivery, 17 Chambers.

1—Stainless Steel Mixing Kettle, 1,000 gals. cap., with Nettco WT-37 Drive.

3—Steel Vertical Pressure Tanks, 4' x 12', 1,000 gals. cap., 125 lbs. working pressure, ASME Code.

12—Steel Welded Vertical Storage Tanks, 9' x 18', 8,000 gals. cap.

1—Steel Vertical Storage Tank, 10,000 gals. cap., 125 lbs. working pressure, ASME Code.

13—Steel Welded Vertical Storage Tanks, 9' x 36', 16,000 gals. cap.

2—A. T. & M. Stainless Steel Suspended Type Centrifuges, 48" Imperforate Baskets.
1—A. T. & M. Stainless Steel Suspended Type Centrifuge, 54" Imperforate Basket.
1—Bird Type 316 Stainless Steel Centrifugal Filter, Solid Bowl, 18" x 28", with motor.
1—Fletcher Underslung Centrifuge, 20" Steel Imperforated Basket.
5—Sharples #16 Stainless Steel Centrifuges, Size 6, Type 1-JY.
1—Tolhurst Stainless Steel Suspended Type Centrifuge, 40" Imperforated Basket.
1—Sharples Stainless Steel Super D Center, Model #PH-14, with motor.
1—Buflovak Double Drum Dryer, 24" x 36".
1—Buflovak Double Drum Dryer, 32" x 90".
1—J. P. Devine Vacuum Shelf Dryer, 9 Shelves.
1—J. P. Devine Vacuum Dryer, 5' x 25'.
6—Louisville Rotary Steam Tube Dryers, 6' x 25'.
1—Louisville Rotary Steam Tube Dryer, 6' x 50'.
1—Ruggles Cole Rotary Kiln, 7½' x 60'.
3—Downington Stainless Steel Heat Exchangers, 500 sq. ft. each.
1—Shriver 24" x 24" Cast Iron Filter Press, 30 Chambers, Open Delivery, Washing Type.
2—Shriver 36" x 36" Cast Iron Plate & Frame Filter Presses, 25 Chambers, Closed Delivery, Side Feed.
1—Shriver 36" x 36" Cast Iron Plate & Frame Filter Press, 49 Chambers, Closed Delivery, Steam Jacketed.
1—Shriver 42" x 42" Filter Press, 38 Wooden Plates & Frames, 3 Eye, Closed Delivery.
3—Shriver 56" Filter Press Skeletons with Hydraulic Closing Device.
1—Sperry 24" x 24" Aluminum Plate & Frame Filter Press, 22 Chambers, Open Delivery.
1—Sperry 30" x 30" Cast Iron Filter Press, 34 Chambers, Recessed Type.
1—Sperry 42" x 42" Aluminum Filter Press, 34 Chambers, Type EHC.
1—Sperry 42" x 42" Cast Iron Plate & Frame Filter Press, 18 Chambers, Closed Delivery.

3—Sweetland Filters #2, 5 & 7.
2—Groen Stainless Steel Jacketed Kettles, 20 & 50 Gals. Cap.
2—Stainless Steel Jacketed Kettles, 150 Gals. Cap. Each.
1—Stainless Steel High Pressure Hydrogenator, 360 Gals. Cap., Working Pressure 250 PSI.
1—Artesian Metal Works Steel Jacketed Kettle, 1,000 Gals. Cap.
2—J. P. Devine Steel Jacketed Vacuum Kettles, 2,000 Gals. Cap. Ea.
2—Koven Steel Jacketed Vacuum Kettles, 1,000 Gals. Cap. Each with Nettco WT-37 Drives and Motors.
1—F. J. Stokes Steel Jacketed Kettle, 500 Gals. Cap.
20—Steel Jacketed Kettles, 380 Gals. Cap. Each.
1—Buflovak Cast Iron Kettle, 300 Gals. Cap.
2—Buflovak Cast Iron Jacketed Kettles, 1,500 Gals. Cap. Each.
1—Nickel Jacketed Vacuum Kettle, 400 Gals. Cap.
1—Nickel Jacketed Kettle, 500 Gals. Cap.
1—Nickel Jacketed Kettle, 10 Gals. Cap.
1—Evedur Vacuum Kettle, 2,000 Gals. Cap.
1—Alloy Fabricating Jacketed Kettle, 1,460 Gals. Cap.
7—Copper Storage Tanks, 3,100 Gals. Cap. Each.
4—Steel Storage Tanks, 6,000 Gals. Cap. Each.
1—Blaw Knox Steel Jacketed Autoclave, 6' x 13'.
1—Blaw Knox Autoclave, 2 Gals. Cap., with Anchor Type Agitator.
2—Patterson Jacketed Vacuum Autoclaves, 4' x 10'.
1—Proudler Steel Autoclave, 1 Gal. Cap.
1—Baker Perkins Mixer, Size 6 with Vacuum Cover and Sigma Blades.
1—Baker Perkins Internal Rubber Mixer, Size 6, Class BB, 2 Gals. Cap. with Chrome Plated Masticator Blades and Pressure Cover.
3—Baker Perkins Jacketed Double Arm Mixers, 100 Gals. Cap. Each with Sigma Blades.

2—Baker Perkins Jacketed Mixers, 200 Gals. Cap. Each with Sigma Blades.
1—Banbury #1 Mixer with 50 HP Motor.
1—Cavagnarro-Loomis Stainless Steel Jacketed Vacuum Mixer, 100 Gals. Cap. with Fish-tail Blades.
2—J. H. Day Mogul Mixers, Size 2½ & 5 Gals. Cap.
1—J. H. Day Jacketed Mixer, 150 Gals. Cap. with Sigma Blades.
9—J. H. Day #3 Brighton Mixers (Pony Type), 175 Gals. Cap. Each.
2—J. H. Day #D-8 Powder Mixers, 2100 lbs. Each.
1—Eppenbach Stainless Steel Homo Mixer with 1 HP Explosion Proof Motor.
1—Gedge Gray Powder Mixer, 2000 lbs.
1—Read Jacketed Double Arm Mixer, 2½ Gals. Cap.
1—Read Stainless Steel Powder Mixer, 100 Gals. Cap.
1—Read Stainless Steel Double Arm Jacketed Mixer, 225 Gals. Cap., with Sigma Blades.
18—Simpson #0 Intensive Mixers.
1—Fitzpatrick Model D Comminuting Machine, Stainless Steel & Bronze Construction.
1—Mikro #1-SH Pulverizer.
1—Mikro #2-TH Pulverizer, Stainless Steel & Bronze Construction.
2—Mikro Stainless Steel Atomizers, #5 & #6.
1—Raymond #00 Automatic Pulverizer.
1—Patterson Porcelain-lined Pebble Mill, Type D, Size 3' x 4', with Motor and Drive Unit.
1—Stokes Model #8B-2 Rotary Tablet Machine.
1—Stokes Model #RD-4 Rotary Tablet Machine.
1—Stokes Model #B-2 Rotary Tablet Machine.

Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. · UNionville 2-4900

LIQUIDATION

CHEMICAL PLANT SPECIALITIES

PUMPS

5 I-R Model 4GT2 capacity 1000 GPM at 1000 ft. hd. 250 HP
2 Multi-stage, Worthington, Model 4UR-1, 500 GPM at 1800 ft. hd. 350 HP
1 Worthington, 4", Model 4 UQ-1, 500 GPM/1000' hd. 200 HP
1 Worthington, Reciprocating Power, Size 6 x 10M 100 HP
1 Worthington, Model 1½ U1 with 10 HP Motor
2 Centr.-American, Size 3" suction, 4" discharge, 2 stage, 1760 RPM, Capacity 750 GPM at 400' hd. 125 HP
1 Centr.-American, 5" suction, 4" discharge, 2 stage, Type BE, 750 GPM at 400' hd. 100 HP
3 Worthington, Reciprocating Power Pumps, Size 4½ x 10 M 100 HP
2 Centr. Weinman, JC, 2 stage cap. 500 GPM/400' hd., 5" suction, 3" discharge, at 2450 RPM 75 HP
1 American—4" x 3", 2 stage high hd., 500 GPM/300 ft. hd. 50 HP
2 Centr.-American—high hd., 2 stage, Size 4" x 3" 500 GPM at 290' hd. 50 HP
1 I-R Model 2 MVR-40, 2 stage 3450 RPM, 250 GPM/320 ft. hd. 60 HP
2 Centr., I-R, Type 2 MRV-40, 250 GPM at 400' hd. 40 HP
1 Centr., Weinman 3" x 3" Model JC, 2 stage horizontally split type centr. pump, 5" suction, 3" discharge, 500 GPM/215 ft. hd. 40 HP
1 I-R Size 1½ MVR 25, 100 GPM, 520' hd. 25 HP
2 Centr. Weinman, K25-2, Type K, single stage close-coupled Unipump, 3" suction, 2½" discharge, 300 GPM/215 ft. hd. 25 HP
2 Deep Well, Deming, Turbine, 12 GPM against 40 lb. discharge pressure at hd. 2 HP
6 Air—I-R (Cameron), Size 5-7 x 7 x 12LS8S.
1 Air-I-R (Cameron), Size 1-4 x 4 x 7 LS8.
1 Centr., Jaeger, Model 3XP, 3" with Wis. Gasoline Engine, Model AZ59
1 Centr., Jaeger, Model 1½ PE, ¾ HP, 1½" suction, 1¼" discharge, Cap. 25 GPM/30' hd.
1 La Bour, Size 2—Type DPM 5 HP
1 La Courteau, Type 8"—H2, 1750 GPM at 87 ft. hd. 75 HP
10 Centr., Sterling, 2" suction, 2" discharge, self-priming Model 20E, 245 GPM/60' hd. 5 HP
1 Pump, Viking, Size 1"—Model ZHCH

COMPRESSORS

3 Stationary Comp. C.P. Type YCM, 2 stage G.E. 8ph 100 hp, 440 v., 60 cy. 2 ph. motor, dir. con. 595 cfm. with exciter and starting panel
3 Stationary Comp. C.P. Type YCM, 2 stage G.E. 8ph. 125 hp, 440 v., 60 cy. 3 ph., motor, direct con. 686 cfm with exciter and starting panel
3 Stationary Comp. C.P. Type YCM, 2 stage G.E. 8ph. 150 hp, 440 v., 60 cy., 3 ph., motor dir. con. 774 cfm with exciter and starting panel.

PLUS: ASSORTED AFTERCOOLERS, MUFFLERS, RECEIVERS, ETC.

BLOWERS

14 High & Low Pressure Blowers in Excellent Condition

ELECTRIC MOTORS

2 Wagner Elec. Corp. 150 H.P. Type RSt, Frame 358, RPM 575, 440 Volt, 3 ph., 60 cycle, 193 amp.
1 GE 30 H.P. Model 16649, 3 phase, 60 cycle, 220 volt, 1165 RPM.
6 GE, 25 H.P., Frame 393, 220/440 v., 3 phase, 60 cycles, 1760 RPM.
1 GE, 25 H.P., 220 v., 60 cy, 1165 RPM.
1 GE, 25 H.P., Frame 405 DS, 220/440 v., 3 ph., 60 cy. 1170 RPM.
1 Star, 25 H.P., 220/440 v., 3 ph., 60 cy. 1750 RPM.
1 Star, 25 H.P., 220/440 v., 3 ph., 60 cy. 1750 RPM.
1 Star—Type A67, 25 H.P., 220 v., 65 amps., 3 ph., 60 cycles, 1750 RPM.
1 Louis Allis Co., 30 H.P. wound rotor induction 220/440 v., 3 ph. 60 cycle, Type OCH, Frame 444, Class 3D, form B, 1165 RPM.

Others down to 1 H.P.—All speeds

POWER EQUIPMENT

220-440-2300 Volt
30-60 Amp.
250 Safety Switches
123 Motor Starters
1—100 HP—with Auxiliary Equip.

LINE POLE TRANSMISSION PROTECTIVE EQUIP. FITTINGS, LUGS & CLAMPS, CIRCUIT BREAKERS, FIXTURES & INDUSTRIAL SUPPLIES.

LURIA BROTHERS and COMPANY, INC.

EQUIPMENT DIVISION
BALTIMORE FIELD OFFICE RT.26 RANDALLSTOWN, MD. P.O. BOX 440: Phone ROslyn 1406
LINCOLN LIBERTY BUILDING PHILADELPHIA, PA. Phone Rittenhouse 6-7455

NEW AND GOOD-AS-NEW EQUIPMENT

Stainless Steel Tanks, new, 100 and 200 gal.
2—563 gal. #316 Stainless Tanks—new.
1—Stainless Tank, No. 430 Chrome, vert. 7' dia., 10' deep, dished bottom, ⅝ plate.
20—Steam Jacketed Kettles, Stainless Steel, Copper & Aluminum, ½ to 250 gals.
1—Copper Evaporator, steam jacketed, 9'1"x3'9".
60—New Pressure Cookers, 18"x18" & 24"x28".
50—Pumps—steam and electric.
1—New Glass Nash Centrifugal Pump, 100 gpm at 40'.
1—Buffovak Impregnating Tank, 42"x52" steam jacketed, used one week.
1—Ribbon type Mixer, steam jacketed.
1—Model 16 Sharpless Stainless Steel Centrifuge.
3—New Drum Rollers.
1—A. F. Bartlett Hog Mill & 7½ H.P. Motor.
1—Sweetland Filter No. 5, 15 leaves.
3—Stainless Steel Jacketed Filters.
2—Plate & Frame Filters, 225" open det.
4—Tanks, 100,000 gals. each.
1—300 gal. Steam Jacketed Double Arm Mixer.
4—Stokes Rotary Tablet Machine RD4.
10—New Sharples Oil Purifiers.
6—New Clecon Can Filling Machine.

SPECIAL—:—1—Vibrex Barrel Vibrator.
1—150 Steam Jacketed Closed Kettle, 150# w.p. on jacket, 270# inside, A.S.M.E.
6—3000 gal. Steam Jacketed Kettles with Turbo Agitators.

H. LOEB & SON :·: 4643 LANCASTER AVE. :·: PHILADELPHIA 31, PA.

FMC

COMPLETE PLANT FOR SALE OR LEASE

Complete, Modern, efficient plant, ready to operate; highly adaptable for chemicals, drugs, pharmaceuticals, foods, etc.

SEVEN BUILDINGS OF BRICK, TRANSITE, STEEL, located on a 10-acre area.

Good labor market, natural gas supply on premises, ample water with water-treating system, air conditioning and storage facilities.

Principal Items of Equipment

- 2 Bird Centrifugals, rubber covered.
- Zaremba Inconel Evaporator.
- Pfaudler XL Reactor, 1,000 gal. capacity.
- 2 Stainless Drum Dryers, drums are 5'x10'.
- 2 Sperry 30" Filters.
- Gas Fired Boiler, 317 HP.
- 2 Mikro Pulverizers.
- Louisville Steam Tube Dryer and Cooler.
- Stainless Bucket Elevator.
- Stainless Moyno Pumps.
- Stainless Piping-Tubing.
- Tanks up to 20,000 gals. in Stainless, Wood, Steel.
- 15 Agitators, "Lightnin" and New England Types.
- Complete Pilot, Testing Laboratory.
- Lab. Drum Dryer in Stainless and Rubber.
- Ovens, Balances, Glassware.
- Distillation Apparatus.
- Large Stock of replacement parts, stand-by material and accessories usually found in modern plants.

For full information, Photographs, Blue Prints, Flow Sheets write to Fred R. Firstenberg, President.

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

Fred R. Firstenberg, Pres.

ROTARY DRYERS

60" x 35' & 70" x 45' Indirect Heat Ruggles-Coles
Direct Heat: 4' x 20', 4' x 45', 4½' x 40', 5' x 30', 6' x 35, 6'9" x 60', 7' x 50', 8' x 70' & 10' x 90'.

MISCELLANEOUS EQUIPMENT

Hammermills: Jeffrey 20 x 24 B & 42 x 36 Flexitooth-Williams 40 GA.
Dings 60"—3 Roll Type I.B.
30", 5', 10" & 16' Mechanical Air Separators
3' x 4' Emco Ball Mill
#0 & #1 Raymond Automatic Pulverizer
4 x 45, 6 x 60, 8 x 50 & 8 x 170 Rotary Kilns
3—6' x 22' silex Lined Tube Mills
8½'-10-8½' x 50' Nodulizing Kiln
10' x 36' Herdinge Air Classifying Ball Mill
Manganese Sulphate Recovery System
Cottrell Precipitator
Hercules Junior 3 Roll Pulverizer
Clyde-Kuntz Continuous Hydrator
7 Elec. Air Compressors, 1500, 3100 & 3374 Ft.
135—8000 & 10,000 Gal. Tank Cars
45 Ton Plymouth Diesel Locomotive
2450 pt Chas Pneu. Elec. Compressor

STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

TRANSFORMERS

STOCK SHIPMENT
1 KVA—7500 KVA
— SPECIAL —
100 15 KVA Air 440/220—110/220
CASH FOR YOUR SURPLUS

ELECTRIC EQUIPMENT CO.
P. O. Box 31, Rochester, N. Y.
WORLD'S LARGEST INVENTORY
MOTORS • GENERATORS • TRANSFORMERS

Somebody—Somewhere,

needs your idle equipment! Reach that buyer quickly and economically thru the

"SEARCHLIGHT SECTION"

The meeting place of Used Equipment Buyers and Sellers

A "BRILL BUY" *is the Best Buy*

A QUARTER CENTURY OF DISTINGUISHED SERVICE

KILNS—DRYERS

1—9'6"x8'6"x200'—¾" shell
1—10'x90'—½" shell
1—9'6"x83'—¾" shell
1—8'6"x108'—½" shell
1—6'x60'—¾" shell
1—Link Belt 11'6"x35' Roto-Louvre
1—Link Belt 2'7"x8' monel Roto-Louvre
3—Ruggles Cole 70"x45', 70" x35', 4'x20'
5—Rotary Dryers 7'x60', 5'x67', 4'6"x40', 4'6"x25'
4—Louisville Rotary Steam Tube Rryers 6'x50', 6'x30', 4'6" x25'
5—Buflovak Vacuum Drum Dryers 5'x12', 4'x8', 24'x20"
3—Stokes & Buflovak Rotary Vacuum Dryers 30"x8', 5'x 20', 3'x15'
3—Blaw-Knox Stainless Steel Rotary Vac. Dryers 42"x8', 42"x10'
1—Brueckner Furnace 8'x11'
1—Single Drum 60"x80" Flaker
1—National Drying Machinery ¾ Truck steam heated Dryer 1680 sq. ft.
3—Proctor & Schwartz 8 and 6 section Single Conveyor Dryers

PULVERIZERS

2—Raymond 4 Roll High Side Mills
1—Raymond 3 Roll High Side Mill
1—Raymond 3 Roll Midget High Side Mill
1—Bauer 36" Attrition Mill with 2—50 HP motors
5—Abbe 8'x8', 4'6"x3'6", 3'9"x3'0", 2'6"x3' Pebble Mills
7—Patterson 6'x16', 6'x8', 4'x5', 3'8"x4', 3'x4' Pebble Mills
2—Premier Colloid Mills 8" dia., S.S.
1—Eppenbach QV7 Colloid Mill
2—Jeffrey 24"x18", 22"x12" Hammer Mills
2—Raymond 8', 4' Air Separators
1—Bull & Jewell #1½ Rotary Cutter
1—Albert 2 Roll Mill 8"x12"
1—5'x22' Tube Mill

MIXERS—ALL TYPES

1—Baker Perkins 300 gal. Unidor Mixer Size 10, S.S.
5—Baker Perkins 100, 30 and 9 gals., jacketed
1—Baker Perkins 2 gal. Stainless, Double Arm
10—Day, Rodgers 200# to 3000# Powder Mixers
12—Electric Portable Agitators ¼ HP to 5 HP. NEW
4—Day, Ross, 8 and 50 gal. Pony Mixers
1—Eppenbach 1HP Homo Mixer, explosion-proof motor
1—J. H. Day 50 gal. heavy duty Mixer

CENTRIFUGALS

3—Tolhurst 48" Center Slung S.S.
2—AT&M 42" Suspended S.S.
6—AT&M 40" Bronze Baskets
1—Fletcher 40" Suspended, S.S.
1—Tolhurst 32" Suspended Monel.
1—AT&M 32" Suspended S.S.
1—AT&M 20" Rubber Covered
2—Bird 36"x36" solid bowl, rubber covered, continuous

FEATURED ITEMS

2—Oliver monel 8'x10' Rotary Vac. Filters
1—Rogers Spray Dryer 16' dia., with all accessories
5—Steel 2000 gal. jacketed, agitated, 200 psi Reactors
1—Bethlehem 1400 gal. steel, jacketed Still
1—Turbo Mixer 1000 gal. jacketed, agitated Steel Kettle
3—Dopp 250, 150 gal. jacketed, agitated Kettles
5—Steel Pressure Vessels 3500 and 8200 gallon
1—Buflovak Type VRC, stainless steel Single Effect Evaporator, 94 sq. ft.
1—Buflovak Type VRC, Triple Effect Evaporator, 900 sq. ft.
1—Buflovak 6' dia. Vacuum Crystallizer
2—NEW Absorption Towers, 13,500 gal. cap.
3—Steel Tanks 15,000, 8,500, 4,100 gal.
3—Raymond 4 Roll and 3 Roll High Side Mills with all accessories
12—Tubular Condensers 200 to 1000 sq. ft.
10—Vallez Filters 44" dia., 30 leaves, 4" centers
2—American Double Drum Dryers 42"x120"
4—Buflovak Double Drum Dryers 32"x100', 36"x84", 32"x72"
10—Stokes Vac. Pumps, 15 to 100 CFM.
1—Enzinger Union Filter, 250 sq. ft. stainless

FILTERS

1—Vallez #49 Pressure Filter 41 leaves
1—Sweetland #12 with 36 S.S. leaves
2—Sweetland #7—27 steel leaves
8—Oliver Rotary Vacuum 11'6"x14', 8'x12', 8'x8', 3'x4'
3—Eimco Rotary Vac. 8'x8', 4'x5', 4'x4'
1—Oliver Rotary Vac. Precoat 3'x4'
6—Feinc Rotary Vacuum 8'x 12', 4'x6', 6'x6', 4'x5', 3'x2'
1—Feinc Rotary Vac. 3'x1' S.S.
2—42" C.I., P&F, 55 chambers, 2"
5—Shriver 30" C.I., P&F, 30 chambers, 1"
1—Shriver 24" Recessed, 30 chambers, C.I.
3—Shriver 18" Recessed, 30 chambers, C.I.
1—Sperry Aluminum 30" P&F, 26 chambers
1—Sperry Aluminum 24" P&F, 22 chambers
1—Shriver Aluminum 12" P&F, 12 chambers
10—Shriver, Sperry Skelatons 40" to 18"

SCREENS

5—Sprout Waldron Stainless Steel Single Deck, 40"x84"
1—Orville Simpson Rotex Double Deck 40"x56"
5—Tyler Hummer 4'x7' Single Deck
5—Tyler Hummer 3'x5' Triple Deck with V-16 vibrators
1—Abbe #2 Bluteress Sifter

MISCELLANEOUS

12—Bucket Elevators, steel housings, 24' to 90' centers, 8"x8" to 24"x8" buckets.
7—Stokes Vacuum Pumps 15 to 100 CFM.
1—Milton Roy Proportioneer Pump, S.S. and Hastelloy, 10 GPM.
1—Oliver Horizontal Dry Vacuum Pump 400 CFM.
5—Devine, Buflovak Condensers and Receivers, 30 to 90 sq. ft.
1—Colton Single Punch Tablet Machine #5½
4—Stokes DD2, D4 Rotary Tablet Machines
1—#1 Anderson Expeller
1—Nash AL673 Hytor Vacuum Pump, 40 CFM
1—Mitts & Merrill #10 Paper Shredder
10—Olivite Duriron & Rubber Centrifugal Pumps, 1½" to 4".

WE BUY A SINGLE ITEM—OR A COMPLETE PLANT

BRILL EQUIPMENT COMPANY

2401 Third Ave., New York 51, N. Y.

Tel: CYpress 2-5703

CHEMICAL EQUIPMENT
BELOW OPS PRICES

CENTRIFUGES
Tolhurst 40" perforated bottom discharge.
Fletcher 40", SS, bottom discharge, perforated.
Bird 40"x60" Cont. solid bowl, rubber lined.
Bird 40" SS, suspended, perforated.
Bird 36"x50" Cont. solid bowl, rubber covered.
Bird 24" Cont. Type CH, Series 200.
Bird 18"x28" Cont. solid bowl w/motor.

BELT CONVEYORS (Troughing)
104' centers, 10" wide belt.
24' centers, 10" wide belt.
56' centers, 16" wide belt.
37' centers, 16" wide belt.
475' centers, 18" wide belt.
300' centers, 18" wide belt.
29' centers, 18" wide belt.
96' centers, 30" wide belt.
50' centers, 42" wide belt.

DRYERS
Tunnel Truck 9"x35"x9', cap. 14 trucks.
Turbulaire N2, Spray with filter.
Stokes, rotary vacuum, 30"x8', w/condenser, dust collector & motor.
Spray 3'x6' Laboratory, sta. steel, elec. heated.
Vacuum Shelf #11 Devine, 170 sq. ft. surface.
Buflovak 5'x6' Atmos. single drum.

DUST COLLECTORS
4700 CFM, Buell, type AC-130 9½AL.

FILTERS
36" open, 27 chambers, wood plates.
30" Sperry, Type 47, 26 chambers.
8'x12' Feinc, all steel.
8'x10' Oliver, wood & steel (3).
11'6"x18' Oliver, all steel.
#7 Sweetland, 2" spacing, 28 leaves avail.

MILLS
5'x22' Smidth, Tube.
6'x8' Patterson, Pebble.
6'x8' Abbe Style GPH, Pebble.
16"x40" Day, 3-roll, ink.
Abbe Size B Grinding.
Kombinator, Flow Master K Model 200.
L. B. Pug, 2' wide 12' long, double shaft (2).

MIXERS
Paddle, 19"x24"x18", complete.
Paddle, double shaft, 140 cu. ft. (NEW).
Readco 1½ SA, 88 gals.
Blystone, 48"x67", 500 gals. (2).
Binks, type, TA660, 100 gals. (2).
Champion, type E, size 2, 110 gals.
Ajax, #3 Super, 173 gals.

KILNS—COOLERS—DRYERS
1106-35 Roto-Louvre.
7"x60'x⅜" with lifters.
6'x14'x9/16" Struthers-Wells (2—NEW).
5'x67'x5/16" with lifters.
4'x34'x5/16" Struthers-Wells.
4'x25'x5/16" brick-lined.
4'x16'x⅜" Iowa with burner & stack.
10'x90'x9/16" Allis Chalmers.
9'x200'x¼".

PRESSURE VESSELS
10,400 gal. 7'x37', 300 PSI test.
8,200 gal. 6'x40'x2", 390 PSI.
3,500 gal. 5'x25'x⅜", 200 PSI (4).
2,000 gal. 5'x13'7½", 106 PSI.
1,250 gal. 4'x14', 106 PSI.
1,200 gal. 42"x16'8"x5/16", 125 PSI, ASME.
1,050 gal. 4'x12'x½", 106 PSI.

STAINLESS STEEL TANKS
3,000 gal. 5'x21'6"x¼", Type 430.
2,300 gal. 5'x16'x¼", Type 304.

VERTICAL TANKS
100,000 gal. 26'x24'x⅜".
8,500 gal., 8'x23'x5/16" (UNUSED).
4,100 gal. 5'x28'x¼" (UNUSED).

TANK CAR TANKS
6,500 gal. 76"x26'7" shell 11/16" & 5/16".

TOWERS
8'x36'x⅜" Absorption (2—UNUSED).
6'x44'x1¼" Scrubber, 5" heads, 225 PSI.
6'x43'x⅜" Bubble Cap, 19 bubble cap trays.
6'x29'8", Bubble Cap, SS, 21 trays.

MISCELLANEOUS
COMPRESSOR—Nash #2.
Condenser—Scraper—8'x15', aluminum.
Crushing Rolls—Sturtevant, 12"x12".
Feeders—Vibrating, Syntron F350.
Vibrating, Type 4 J.T. 155.
Gas Purifier—2000CFH.
Sublimator—Horizontal, 4'x10'.

→ ABOVE IS ONLY PARTIAL LISTING OF OUR INVENTORY ←
ASK FOR BROCHURE

Heat and Power Co., inc.
70 PINE STREET NEW YORK 5, N. Y.
MACHINERY & EQUIPMENT MERCHANTS

Start The NEW Year With An OLD Reliable Source

2—New Tolhurst 48" Stainless Steel Center Slung Centrifuges
1—Buflovak Vac. Shelf Dryer 12 Shelves 42" x 42"
1—Stokes Vac. Dryer 6 Shelves 24" x 36"
1—Devine Lab. Vac. Dryer 3 Shelves 16" x 34"
1—Black & Clawson Nickle Plated Drum Dryer 48" x 48"
1—Buflovak 6' Vac. Crystallizer
3—Shriver C.I. Filter Presses, 24", 30", 42"
1—Sweetland #12 Filter, S.S. Leaves
1—Struthers-Wells 350 Gal. Steel Reactor
8—Stainless Steel Kettles, Jacketed & Agitated 100; 150; 250; 950 and 2700 Gals.
6—New Stainless Steel Tanks 500 to 1000 Gals.
2—Steel Tanks, Horizontal 10,000 Gals.
3—Aluminum Tanks 1500 Gals.
3—Aluminum Bubble Cap Columns 27" and 36"
1—W & P 100 Gallon S.S. Mixer Double Arm
3—Robail & Rotex Screens 40" x 104" and 40" x 120"
1—Mikro #2 FF Pulverizer, S.S. 7 Brse. Const.
1—S.S. Condenser—200 Sq. Ft.

We Buy Individual Items to Complete Plants

Machinery Equipment Corp.
533 West Broadway
New York 12, N. Y. GRamercy 5-6690

BMC

EXCEPTIONAL OFFERING
LARGE PEBBLE MILLS
6 Porcelain Lined Mills—Like NEW

MAKE:—International Engineering Co.
SIZE:—8' x 8'.
CAPACITY:—2655 gal. total: 1600 gal. working.
CONSTRUCTION:—All welded steel.
LINING:—Porcelain like new.
CONDITION:—Like new.
DRIVE:—Trunnion drive; spur gear.
MOTOR:—Gear motor—50 HP. 3/60/220-440/1760/100 RPM.
ACCESSORIES:—Line starter; unibrake; push button controls.

For Location, Price, and Additional Information, Write, Wire or Phone

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

FRED R. FIRSTENBERG, Pres.

Blending System—4 unit—860 cu. ft. ea.
Mills, Pebble—30x20, 30x30, 36x42 5 pocket lab. w/expl. prf. motors.
Mills, Hardinge—5'x22", 8'x22", 7'x48" w/motor driven.
Filter Presses—24" center feed, 72Lf. 30" w/25 pdf, wash-open, 36" Read. pl. 62Lf. 42" w/26 pdf. closed, non-wash.
Filters—Laughlin, Bird 4'x2', Sweetland #5, #12.
Vacuum Pumps—Nash Hytor H5—Devine 10"x10".
Crushers Jaw—6x9, 8x14, 14x26, 24x36.
Crushers, Roll—12x12, 30x16, 48x18.
Skids, 1000 wood top, Steel Reinf.—legs—42x54x11 High.
Dust Collector—Dracco 4 Compt. Perfecto AA 1050 sq. ft.
New Pumps—Compressors—Exhausters.

LAWLER COMPANY
Durham Avenue Metuchen, N. J.
Metuchen 6-0245

BOILERS
10 to 1000 H. P.
NEW-USED RECONDITIONED
Steam, Gas and Electric Power Equipment
J. PARKER THOMPSON CO., INC.
507 FIFTH AVE., NEW YORK CITY
MURRAY HILL 7-8547-8-9

FOR SALE
1—42" x 10" Allis-Chalmers crushing rolls.
1—36" x 16" Sturtevant crushing rolls.
2—24" x 14" Farrell-Bacon crushing rolls.
1—6' Raymond Whizzer separator.
1—4' x 8½', 3 deck, Robins "Gyrex" screen.
8½' x 60', 7½' x 60', 7' x 68', 6' x 60', 5' x 25', 4' x 30' and 3' x 30' dryers.
New dryers in stock.
W. P. HEINEKEN
80 Broad St. Tel. Whi. 4-4238 New York 4, N. Y.

AIR COMPRESSORS VACUUM PUMPS

For 50 Years

AMERICAN

FINEST IN REBUILTS

Your Choice

Stationary

American
Bury
Chicago Pneu
Curtis
Davey
Gardner Denver
Ingersoll Rand
Le Roi
Pennsylvania
Schramm
Sullivan
Worthington

Horizontal
Vertical
Electric
Steam

Portable

Gasoline
Diesel
Pneu Tired
Skids
Steel Wheels

RENT—SELL—BUY
BEST BY TEST
OVER 200 IN STOCK

AMERICAN AIR COMPRESSOR CORP.
NORTH BERGEN NEW JERSEY

FOR SALE

Filter Presses: 24" C.I. plate and frame.
Reactors: 250 gal. stainless steel.
Dryer: atmospheric double drum 36x80".
Centrifugal: Fletcher 17" port, stain. steel.
Evaporator: Buffalo 300 sq. ft. triple effect.
Autoclave: 10 gal. Buffalo, cast iron.
Vacuum Pan: 6' Harris stainless steel.
Kettle: 800 gal. copper closed steam jack.
Powder Mixers: 100 to 2000 lb. capacities.
Pebble Mills: 200 gal. Patterson bobrstone lined.
Mills: 3-roll high speed and slow speed.
Colloid Mills: Premier, Charlotte, Eppenbach.
Oil Purifier: De Laval No. 600.
Glass lined Tanks: 1500, 3000 gal. steam jacketed agitated.
Mill: Hardinge 5' x 20' buhrstone lined.
Dryers: 5 x 12' Buffalo vacuum drum.

WE BUY—WE SELL—WE LIST

LOEB EQUIPMENT SUPPLY CO.
1927 W. North Ave. Chicago 22, Ill.

BOILERS

10 to 3000 H.P.
Diesel, Steam Turbine, Engine

GENERATORS

Heavy Power Equipment
Industrial — Chemical Process
Equipment

NEW – RECONDITIONED – USED

DEAN G. STRICKLER & ASSOCIATES
1346 Connecticut Avenue, N.W.
Washington 6, D. C. • DuPont 3386

FILTER PRESSES—Sperry—Shriver—Johnson —7"—12"—15"—24" and 30"

STAINLESS STEEL TANKS—500 Gallon to 3750 Gallon

STAINLESS STEEL KETTLES—40 Gallon to 150 Gallon

U. S. AIR CONDITIONER—Type RK—Serial #9410-29 — 10 Hp. Motor — Complete with blower unit and motor—Self-contained—Practically New

AARON Equipment Company

1347 So. Ashland Ave., Chicago 8, Illinois
PHONE: CHesapeake 3-5300

FOR SALE

1 Illinois Water Treating System, 500 GPH flow rate, complete with Zeolite tank, controls, etc.
1 Hardinge Conical Ball Mill, Steel Liner, 4'0" dia. x 24" long, complete.
3 Sprout Waldron Attrition Mills, double disc—sizes 16 and 30.
1 Williams Hammer Mill, type AK; size A, stainless steel.
1 Mikro Pulverizer—#2-SI
1 Fitzpatrick Model "D" Comminuting Machine, Stainless Steel

8—3000 gal. Horizontal Demountable Stainless Steel Truck Tanks, 5'4" dia. x 18'9" long, insulated and agitated. Excellent for transporting, storage or holding.

3 INDUSTRIAL FILTER & PUMP MFG. CO. Pressure leaf filters, type RB-2, size 10 x 48, approx. 68 sq. ft.; rubber lined tank, bronze baffles. With slurry tank, pump & motor.
2 Sweetland Filters—#2 and #3.
1 Swenson Rotary Continuous Vacuum Filter; Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
1 FEINC Rotary Vacuum Filter, string discharge, 4'8" dia. x 6' face, aluminum.
10 Filter Presses, 12" to 36", C. I., P&F.
2 Louisville 6-roll Continuous Grains Presses, 24" and 36".
1 Pan, Dryer or crystallizing Kettle, 10' dia. x 3' deep.
1 Stokes #59A Vacuum Rotary Dryer, 18" dia. x 42" long, with pump and condenser.
2 Atm. Double Drum Dryers, 22" x 38".
1 Cummer Rotary Indirect Hot Air Dryer, 4' dia. x 30' long, complete.

LIQUIDATING FORMER SCOTTISH AMERICAN DISTILLERY
Foot of Alexander St., Peoria, Ill.

1—42" dia. Copper Rectifying Column, 21'2" high, 37 bubble cap plates.
3—Copper Condensers; 75 sq. ft., 340 sq. ft.
2—2053 gal. Welded Steel Yeast Tanks, copper coils.
1—Richardson Auto. dump scale "FF", 2 bu.
1—Burmeister 32" x 80" grain cleaner.
1—Hehle 2-roller mill, 9" x 22".
1—Barnard & Lous 3-pair high roller mill, 9" x 18".
1—Ingersoll Rand Bronze Centrifugal Motorpump #2-MRV-30, 175 GPM @260', 20 HP mot.
4—Screw Conveyors: 9" x 15', 9" x 13', 12" x 25½', 12" x 21'.
8—Vertical Agitator Drives, 1 HP G.E. Gearmotors, 3/60/220—440/60 RPM shaft speed.
Contact Mr. Zarow at Peoria 2-4524.

1 Porter heavy duty jacketed double worm mixer—75 gal.
2 Read heavy duty double arm jacketed mixers, 200 gal. working cap.—1 stainless lined.
1 Broughton Powder Mixer, double arm, 2400#.
4 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
2 Kux Mach. Co. Model 25 Rotary Pellet Presses, 21 & 25 punch—with motor and vari-drive.
8—Stokes Rotary Pellet Presses, 16 punch —B-2, D-3, D-4.

STAINLESS STEEL KETTLES
20# Jacket—Vertical Agitators
1—2700 gal. cap. 7'6" dia. x 7'6" high.
1— 950 gal. cap. 63" dia. x 78" high.
Type 347 stainless steel shell, bolted cast iron top.

70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 40, 60, 80, 100, 150, 250, 500 gal. sizes.
40 Stainless Steel tanks—6, 30, 60, 100, 150, 200, 400, 500, 900, 1000, 1400, 2000, 3500, 5700 gal. sizes.
1 Stainless Steel, type 347 Autoclave or pressure tanks; 25# pr. Elec. heated 650° F; 100 gal. cap., 17¼" dia. x 9' high.
5 Aluminum Tanks 500, 1100, 1350 & 1485 gal.
1 Glass Lined Kettle, Jkt'd. & Agit. 50 gal.
1 Pfaudler 1 gal. Glass Lined Autoclave, 500# Pr., Agitated, Gas Fired.
1 Steel Autoclave, 120 gal., 23" dia. x 74" deep, 125# int. pr. 15# jkt. pr.

5—Vertical Jacketed Pressure Tanks—steel — 30# steam jacket — 6mm vacuum internally:
3—34" ID x 15' H (approx. 700 gal.)
1—23" ID x 10' H (approx. 250 gal.)
1—23" ID x 9' H (approx. 195 gal.)

1 Bird Suspended 48" steel centrifugal Perf. basket.
2 DeLaval #600 Oil Purifiers.
2 Copper Vacuum Kettles, 48" dia., jacketed, agitated.
1 Copper Vacuum Evaporating Pan, 8' dia.—jacketed and coils.
1 Struthers Wells Evaporator, 100 sq. ft.
2 Spencer Turbine Co. Gas Boosters or Compressors, stainless steel, 30 HP motor, 600 CFM at 80 os. pr.
2 Ingersoll Rand Type PS-538 Blowers, 4000 CFM at 3 lb. pr.
1 Byron Jackson Deep Well Pump, 150 GPM—325' head, NEW.
1 Ingersoll Rand Bronze Centrifugal Pump #5ALV, 40 HP motor, 850 GPM at 140'—NEW.
2 Ingersoll Rand Bronze Centrifugal Pumps, #11½-RVH, 20 HP motor, 500 GPM at 230'.
6 Shell & Tube Condensers: 30 & 200 sq. ft. Stainless Steel; 487 sq. ft. copper, 198 sq. ft. aluminum.
2 Copper Beer Still Columns with condensers, etc., 24" dia., 30" dia.
6 Copper Bubble Cap Columns, 18" dia. to 48" dia.
2 Aluminum Bubble cap Columns, 27", & 36" dia.
1 Aluminum Perforated Column, 28" dia.
1 Steel and Cast Iron Bubble Cap Column, 62 plates, 30" dia.

STAINLESS STEEL FABRICATION
We have in stock a quantity of Stainless Steel sheets: Type 304—12 ga., 14 ga. and 16 ga. Tanks, receivers, etc. fabricated to your specifications.
Write: Attn. Fabricating Division.

BOTTLING CANNING PERRY SUPPLIES PROCESSING

PERRY EQUIPMENT CORP.

1413 N. 6th St. STEVENSON 4-7210 PHILA. 22, PA.

QUICK DELIVERY ON GUARANTEED EQUIPMENT

Large Stock at our Brooklyn Warehouse & Shop

DRYERS & KILNS

2—Proctor & Schwartz 6 fan automatic Conveyor Dryers, 2 Roll 49" Chilling Unit.
2—Allbright-Nell 4'x25' Atmos. Drum Dryers.
1—Buffalo Vac Drum Dryer 24x29". Also Rotary Vac. Dryers & Vac. Shelf Dryers.
6—Steam, Gas & Electric Dryers, Tray, Truck & Conveyor Types.
6—Rotary Dryers, Direct & Indirect. Also Jacketed & Steam Tube.
1—Ruggles Coles 7½'x80' Rotary Dryer.
New Rotary Dryers, Kilns & Coolers built to order.

CENTRIFUGAL & CENTRIFUGES

5—Tolhurst 30" Suspended Type Centrifugals, Bottom Discharge, Monel Screen.
9—Centrifugals 20", 30", 40" & 48", Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #5A Stainless. Also #6.
3—De Laval Multiple Clarifiers #200, 300 & 301.

FILTERS

3—36" x 36" Corner Feed Iron Filter Presses.
10—Sperry & Shriver 7", 12", 18", 24", 30", 36", 42", Iron & Wood Filter Presses.
1—12" Bronze Filter Press.
Extra 30" & 42" iron plates & frames.
1—Vallez 41 Stainless Covered Leaf Filter, type 49.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

Devine 1000 ga. closed jack agit. steel kettle.
8—Jacketed Kettles 50 to 1000 gals.
1—250 gal. Lead Lined Kettle.
New Stainless Steel Tanks 50 to 500 gals.
10—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks.
6—Copper Varnish Kettles 150, 200 & 300 gals.

PULVERIZERS & MILLS

1—#32 Raymond Pulverizer with 20 HP. AC motor, Vac. Separator & Cyclone Collector.
1—Raymond #00, Pulverizer 30 HP. Complete.
4—#0000 Raymond Mills.
Mikro Pulverizer 20DH, 10 HP.
2—#40 Williams 200 H.P., M.D., Hammer Mills.
8—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.
1—Sturtevant 30" Rock Emery Mill.
1—Robinson 22" Attrition Mill.
1—Double Roll Crusher 10" dia. x 14" face.
1—Lehman 4 Roll W. C. 12" x 36" Steel Mill.
5—Lehman & Kent 3 Roll Steel Mills.
8"x22", 9"x32", 12"x36" 15"x40".
1—9" x 36" Double Steel Roller Mill.
1—9" x 24" 3 pr. high steel Roller Mill.
3—Hoschin 18" x 36", 4 Roll Granite Stone Mills.
1—Abbe Pebble Mills 6'x6' & 30"x42" & 24"x24".
6—Abbe Jar Mills Lab to 25 gal. sizes. Ball & Jewell #0 Rotary Cutter. Leominster #0 Rotary Cutter.
1—U. S. Colloid Mill 1½ HP Motor.

MIXERS—ALL TYPES

Baker-Perkins heavy duty double arm Jack. Mixers, 200 & 3 gals.
Horiz. Mixers single & double arm to 200 gal.
Day 40 gal. Pony Mixer & other sizes.
1—Century 2 HP, 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
1—Simpson Intensive Mixers #20 to 7½.
Patterson 3½' dia. Stainless Conical Blender.
1—Waster Drum Type Blender 1900#.
10—Dry Spiral Mixers 50 to 2000 lbs.
12—Portable Elec. Liquid Mixers ¼ to 3 HP.

SCREENS & SIFTERS

2—Tyler #3B Jr. Hummer Screens, 20" x 30".
1—Rotex Sifter 20 x 60", 4 Surface.
2—Gyratory suspended Sifters 20" & 24".

MISC. & SPECIALS

4—French Oil Linseed & Cottonseed Hydr. Presses.
4—French Oil Motor Driven Expellers.
New 6" x 12" Lab Mixing Mills & Calenders.
1—Farrel 15" x 36", 18" x 42", 18" x 48" & up to 22" x 60" 2 Roll Mixing Mills.
3—Rubber & Plastic Extruders 1' to 6".
1—Stokes 2E Paste Filler up to 5 gal.
1—Marco #200 Stainless Steel Homogenizer.
4—Stokes & Smith & Day Powder Fillers.
6—Filling Machines, Liquid, Paste & Powder.
5—Rotary & Single Punch Tablet Machines, ½" to ¾ dia.
2—Revolving Pans 30" & 36".
4—Stokes Vert. High Vac. Pumps.
2—Hersey Mogul Barrel Packers.
2—Worthington 12" x 12" x 12" Vac. Pumps.
6—Devine & Buffalo Vac. Pumps.
Soap Machinery for Toilet Laundry Chip Liquid.
Hydr. Presses, Pumps & Accumulators for Rubber & Plastics, Injection Molding Machines.
Boilers, Gas, Oil & Coal Fired.

WE BUY YOUR SURPLUS MACHINERY & COMPLETE PLANTS
PARTIAL LISTING. WRITE FOR BULLETINS. PHONE: WORTH 2-5745

STEIN EQUIPMENT COMPANY

90 West Street, New York 6, N. Y. **Cable: Machequip**

SEPARATORS: One Sturtevant 8 ft. and one 10 ft. with extra heavy liners, condition like new, either or both with steel supporting structure. One 30" Gayco. One 4 ft. Whizzer.

CLASSIFIERS: 4—Akins 54" and one 30". Simplex, single screw, Weir type, with 440 volt, AC motors. 1—Dorr 8' x 18'4" and 1—6' x 18'4" Class DSF.

DRYERS or KILNS: 2—Allis Chalmers 10 ft. x 90 ft., heavy duty, plate thickness 22.95 lbs. per sq. ft., complete and with or without coal fired Furnaces, Western Precipitation Dust Collectors, Clarage #41 Exhauster, Motors, control equipment, etc.

PULVERIZERS: Hardinge Mill size 8 ft. x 22" steel lined, complete with disc feeder and 30 H.P. motor. 1—10 ft. x 36", Hardinge Conical Ball Mill with 300 H.P. motor and all auxiliary equipment for dry grinding. 1—5' x 36" silica lined. 1—Sturtevant 14 Ring Roll Mill.

COAL CRUSHER: Jeffrey Flextooth 24" x 42" with Allis Chalmers, type ARE, 75 H.P. motor, 3 phase, 60 cycle, 2300 volt, 24 hrs., 55 deg., 1170 R.P.M. with 5 groove V belt pulley.

REDUCTION CRUSHERS: 2—Newhouse 10" with 220/440 volt motors. 1—Symons 3 ft. with coarse bowl, without motor. 1—Symons 3 ft., short head, fine bowl, and one Traylor type "T", 2'6" with 9" opening, both with 75 H.P., 440 volt motors, V-belt drive.

COMPRESSOR: Worthington 2 stage, 20/18½ x 21, type DCS, 600 H.P., synchronous motor, 3 phase, 60 cycle, 440 volt, 180 R.P.M. cap. 3000 CFM, 100 lbs. pressure, complete with auxiliary equipment. In operation now, available immediately. 1—Worthington 15—9½ x 12, cap. 700 CFM @ 100 lbs., direct connected to 400 volt, 125 H.P. synchronous motor, with all auxiliary equipment.

DIESEL MOTOR: 123 H.P. Caterpillar D13000 complete with clutch, V-belt pulley and spare parts.

BOOT BUCKET ELEVATORS: 2—43 ft. 6" manganese steel chain, buckets 16" wide. 1—70 ft. 6" buckets 8 x 5 on #78 Reliance chain. NEW, UNUSED.

THICKENERS: Acid Proof Thickeners, one 160 ft., one 250 ft. diameter. 1—45' x 12 ft. 1—24 x 8, type A.

AGITATORS: One 36 ft. and one 28 ft. 1—Dorr 25' x 22' type A.

FILTER: 1—Oliver 14 ft. dia., 10 ft. face.

MAGNETIC PULLEY: 24" with 1½ KW MG set with or without 24 x 160' conveyor, 7½ H.P. motor and drive.

A. J. O'NEILL
LANSDOWNE, PA.
PHILA. PHONES:
Madison 3-8300—3-8301

ECH SPECIALS

2 Patterson 6' x 5' Porcelain Lined Mills, with 30 HP AC motors.
2 Day Robalt #71 Sifters, 40" x 84", with 2 HP Motors, S.S. & Steel.
5000 Gal. Steel Reactor, Jkld. for 200# Pressure, 200# Int. Pressure, Agit., with 15 HP Motor.
5 Abbe Belgian Block Lined Mills, 5' x 6', 4½' x 5'
170 Gal. 304 S.S. Autoclave, good for 3500 PSI
J. H. Day Jkld. Vacuum Mixer, 5 gal. Working, S.S. Sigma Blades & S.S. Bowl. Like New
Type 347 S.S. Tumbling Barrel, 5' x 5'
9 Shriver & Sperry Filter Presses, 6" to 42"
Day 15 Gal. Jkld. Mixer, 2 Cored Masticor Arms, with Reducer & 5 HP motor
S.S. Fitz Mill, Model D, 5 HP AC motor
2 New Steel Vacuum Reactors, 48" x 48"
2 3500 Gal. Steel Evaporators, Jkld., ASME
Bird Continuous Centrifuge, 18" x 28"
Kent Hy-Speed 12 x 30 Roller Mill, 3 rolls water cooled, with 15 HP motor

WHAT HAVE YOU FOR SALE?

for BETTER BUYS & Service
Phone SOuth 8-4451—9264—8782

You can BANK on

EQUIPMENT CLEARING HOUSE, INC.
289-10th ST. BKLYN 15, N. Y.

STEEL STORAGE TANKS

18—8000 & 10,000 Gal. R.R. Car Tanks.
6—25,000 Gal. ⅜ Inch Horizontal.
22—10,000 & 15,000 Gal. ½ Inch Horiz.
9—2500, 5000 & 10,000 Bbl. Vert.

L. M. STANHOPE Rosemont, Penna.

LIQUIDATING
STILL ON LOCATION!

MULTIPLE EFFECT EVAPORATORS

Long Tube Double Effect Copper Evaporator; 2000 sq. ft. per effect, with condensing equipment complete.

Copper Triple Effect Calandria Evaporator; 2500 sq. ft. per effect, with condensing equipment complete.

Copper Quadruple Effect Calandria Evaporator; 2005 sq. ft. per effect, with condensing equipment complete.

Swenson Welded Steel Long Tube Evaporator consisting of 5 bodies; one to five effects may be used; heating surfaces from 3000 sq. ft. to 5629 sq. ft. each; complete with all operating accessories.

2 Goslin Birmingham Steel Sextuple Effect Evaporators; each has total effective heating surface of 10,200 sq. ft. complete with all operating accessories. (Prints and additional details on request.

2 C.H. Wheeler Horizontal Surface Condensers; one with Cast Iron Shell 54"x17'2" with copper tubes; approximately 4000 sq. ft. of heat transfer surface; the other has Cast Iron shell, 42"x14'9" with Muntz Metal tubes; approximately 2100 sq. ft. heating surface.

ACID TILE LINED APTOCLAVES

Acid tile lined steel autoclaves 6'10"x14' in the straight with cast iron tops and bottoms; ½" thick riveted steel shell designed for 100#/sq. inch; approximately 3375 gal.

BUFFALO VACUUM DRUM DRYERS

3 Buffalo Vac. Drum Dryers with bronze drums 5'x12', with copper contact parts, pumps, doctor knives, screw conveyor, 30 H.P. motor, etc.

3 J. P. Devine Dryers same as above but 5'x10'0" with 25 H.P. Motors and complete accessories.

Send for Special Bulletin on the Above Offerings

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

Fred R. Firstenberg, Pres.

For Sale **For Sale**

1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 40 hp explosion-proof motor.
1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 20 hp explosion-proof motor.
1—J. H. Day #2, 75 Gal. Brighton Mixer.
5—Pebble Mills 40 to 500 Gal.
10—Pony Mixers 8, 15 and 40 Gal.
HIGH SPEED Roller Mills 9"x24" to 18"x48".
1—Mateer Driven Belt Conveyor.
3—6" Premier Colloid Mills, watercooled.
1—#2DH Mikro-Pulverizer with a 10 hp. motor.

SPECIALIZING IN REBUILT MACHINERY

Irving Barcan Company
249 ORIENT AVE.
JERSEY CITY 5, N. J.
Phone—DElaware 2-6695-6

FOR SALE

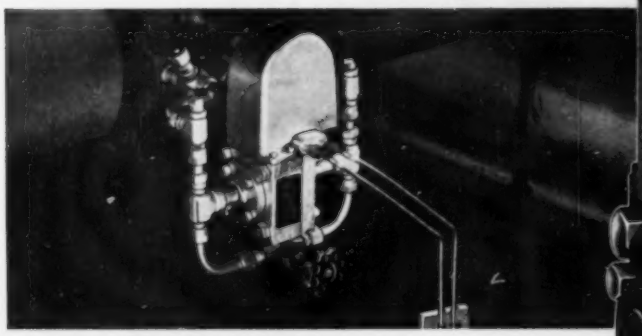
100 to 250 gal. S.S. Mix Tanks, water jkt.
500 gal. Stainless Steel Mix Tank 71" x 36".
4000 gal. Horizontal S.S. Tank, 57" x 17'7".
4000 gal. S.S. Truck Tanks & Trailers.
S.S. Heat Exchangers, Plate & Surface Type.
400 gal. S.S. Clad Jkt. Kettles, 30" x 52".
150 gal. S.S. Jkt. Kettle, 42" x 54", agit.
300 gal. Copper Tank, 42" x 36".
100 gal. Pfaudler Horiz. Glass Lined Tank, 25#.
Day Vibrating Screen, 40" x 196", 1 H.P.
32" x 90" Bufkovak Double Drum Dryer.
—50 gal. Steel Kettles, 75# jkt., A.S.M.E.
Premier Colloid Mill 6", 7½ H.P. motor.
Gruendler Jr. Pulverizer, 10 H.P.
75 to 1500 gal. Homogenizers or Viscolizers.
28" Centrifugal Extractors, copper baskets.
60" Centrifugal Extractors, s.s. baskets & curbs.
Model 148C Stokes High Vacuum Pump, 1½ H.P.

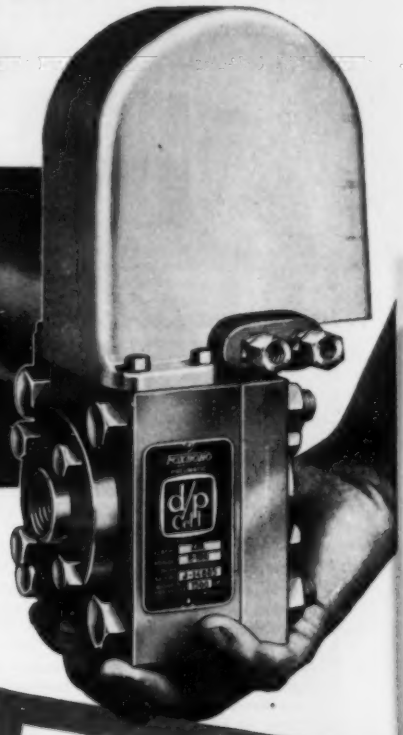
Send us your inquiries

LESTER KEHOE MACHINERY CORP.
1 East 42nd Street, New York 17, N. Y.
MUrray Hill 2-4610

Simplest Flow Measurement

with the ALL-METAL Foxboro d/p Cell!





. . . gives fastest response, longest sustained accuracy, lowest installation cost

Simpler in design, simpler and much less expensive to install, far easier to maintain . . . the all metal Foxboro mercury-less d/p *Cell* offers greater speed of response, permitting closer flow *control*, than has ever been possible before. Its negligible displacement and corrosion-proof construction of Type 316 Stainless Steel eliminate usual maintenance problems, even in service on highly corrosive or viscous fluids previously considered unmeasurable.

The Foxboro d/p Cell measures differential pressure by the force-balance principle and transmits pneumatically to indicating, recording, or controlling receivers. Small, compact, weighs as little as 19 lb. Ranges: from 25" to 800" H_2O. Working pressure ratings up to 4000 psi. Steel or stainless steel construction. Inherent over-range protection. Easy in-the-field calibration and range changes. Optionally available with pre-assembled manifold piping shown in photo above.

Thousands of d/p Cells now in use throughout industry, with many repeat orders now on our books, indicate the wide acceptance and successful performance of this revolutionary development for the measurement of liquid, steam, gas, or air flow. Write for detailed Bulletin 420. **The Foxboro Company, 381 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

- No seal pots
- No mercury
- No leveling
- Installed at the orifice

FOXBORO
REG. U. S. PAT. OFF.

RECORDING · CONTROLLING · INDICATING
INSTRUMENTS

FACTORIES IN THE UNITED STATES CANADA, AND ENGLAND

Longer Life for Transformer Oils WITH DBPC

...also available in an oil solution for easier application

When Di-tert-butyl-para-cresol (DBPC) is added in liquid form to transformer insulating oils, their resistance to oxidation is increased and their useful life is greatly extended.

The value of Koppers DBPC as an inhibitor for new or reclaimed oil has been proved. Actual use has confirmed the accelerated oxidation tests shown below. Further, many manufacturers of transformers now endorse the use of DBPC, and most major suppliers of transformer oil will, on request, furnish new oil that has been inhibited.

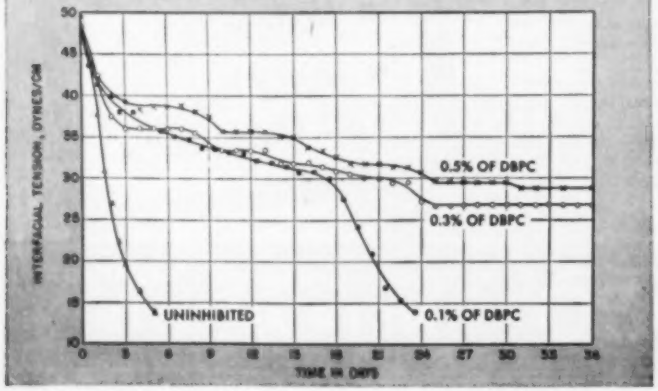
When ordering new or make-up transformer oil, make certain it is inhibited. And use DBPC to prolong the life of your reclaimed oil. The savings you'll get will be worth your while.

If desired, we can furnish a compounded oil solution of DBPC called Impruvol 20. Impruvol 20 can be used with simple equipment. Its application presents no more problem than the application of insulating oils themselves. Order Koppers DBPC or Koppers Impruvol 20; the choice is yours.

KOPPERS

KOPPERS COMPANY, INC.
Chemical Division **Pittsburgh 19, Pa.**

Interfacial Tension values under 95°C Oxidation Tests show DBPC inhibited oil impressively delayed in oxidation and at no stage as rapid as uninhibited oil.



Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you—just for the reading.

Leaders in business and industry turn to the advertising because they've discovered it helps them run their businesses more profitably.

When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

Double Barrel Advertising

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

Direct Mail supplements your display advertising. It pinpoints your message right to the executive you want to reach—the person who buys or influences the purchases.

More and more companies are constantly increasing their use of Direct Mail because it does a job that no other form of advertising will do.

McGraw-Hill has a special Direct Mail Service that permits the use of McGraw-Hill lists for mailings. Our names give complete coverage in all the industries served by McGraw-Hill publications—gives your message the undivided personal attention of the topnotch executives in the industrial firms. They put you in direct touch with the men who make policy decisions.

Some people have a wrong conception of Direct Mail. There's no hocus-pocus to it—there's no secret formula—nor is there need for an extensive department to plan and execute your mailing program. You don't even need your own mailing lists.

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance in industrial personnel. Our lists are compiled from exclusive sources, based on hundreds of thousands of mail questionnaires and the reports of a nationwide field staff, and are maintained on a twenty-four hour basis.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low overall cost and the tested effectiveness of these handpicked selections.

McGRAW-HILL PUBLISHING CO., INC.
330 WEST 42nd STREET, NEW YORK 18, N. Y.

Announcing the
DUAL-TUBE
Something Brand New in MANOMETERS by MERIAM

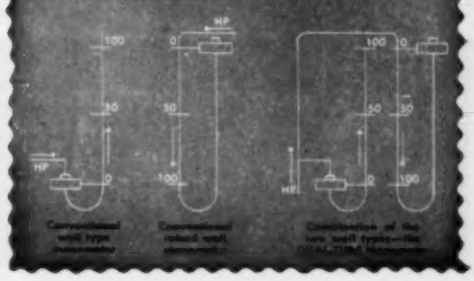
• Now, instead of standing on a step ladder—as when reading long range, single column manometers—the operator can read high range pressures, vacuums, and differentials from the floor level.

This new manometer development—the DUAL-TUBE, Meriam Model M-100 — consists of two separate manometer tubes in the same case—each tube with individual well. The left tube has a scale increasing upward; the right tube a scale increasing downward. Both tubes are connected in parallel to the same pressure source.

The instrument is ideal as a calibrating standard manometer for checking flow meters, pressure gauges, and other secondary units operating on pressure or vacuum principle. It is direct reading. Since both tubes indicate the same reading, the operator can choose the one most convenient.

It helps avoid accidents, saves time and effort in reading. Of simple, rugged construction, it is built in accordance with Meriam standards of accuracy and sensitivity for long, reliable service. Ask for Catalog Sheet M-100WM.

THE MERIAM INSTRUMENT COMPANY
10916 Madison Avenue • Cleveland 2, Ohio
WESTERN DIVISION:
4709 E. Olympic Blvd., Los Angeles 22, Calif.
IN CANADA: Peacock Bros., Ltd., Montreal



DIRECT HEATING OF VAPORS

DIRECT HEATING OF LIQUIDS

If your plant requires

DOWTHERM INDIRECT HEATING

STEAM GENERATORS

STEAM SUPERHEATERS

GAS CRACKING HEATERS

. . . place the selection of the specific type in specialized hands . . . and obtain optimum efficiency.

Petro-Chem Development Company engineers are heating specialists . . . they can supply the whys and wherefores of indirect versus direct heating and the economics of both.

Every day more than 950, oil and gas fired, Petro-Chem Iso-Flow installations in the petroleum, chemical and allied industries, demonstrate the efficiency of their design and installation.

PETRO-CHEM DEVELOPMENT CO., INCORPORATED

120 EAST 41ST STREET, NEW YORK 17, N. Y.

REPRESENTATIVES

Bethlehem Supply, Tulsa and Houston · Flagg, Brackett & Durgin, Boston · D. D. Foster, Pittsburgh · Faville-Levally, Chicago · Lester Oberholtz, California · Gordon D. Hardin, Louisville, Kentucky

"But you can't buy that kind of a motor..."

How many times have you heard somebody that ought to know better say something like that about motors, pumps, compressors or what-have-you? And how many times have you heard somebody else say, "Oh yes you can! I saw just what we need in Blank Company's ad yesterday." Advertising pages in this magazine are packed with *news* about your business. They contain information about products and services designed to help you do your job quicker, better and cheaper. To be well-informed in *your* business, *your* industry . . . about the latest developments and to stay well-informed . . . *read all the ads too.*

McGRAW-HILL PUBLICATIONS

DOUBLE BARREL Advertising

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

Direct Mail supplements your Display Advertising. It pin-points your message right to the executive you want to reach—the person who buys or influences the purchases.

More and more companies are constantly increasing their use of Direct Mail because it does a job that no other form of advertising will do.

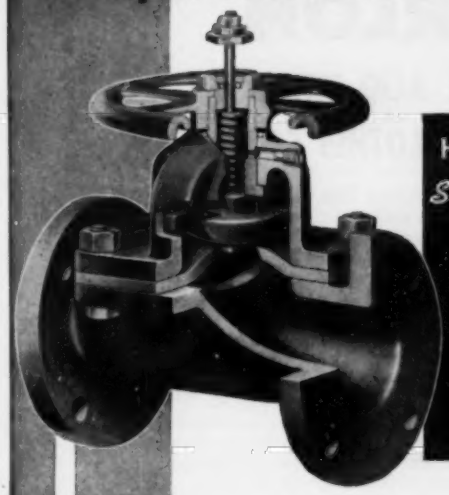
McGraw-Hill has a special Direct Mail Service that permits the use of McGraw-Hill lists for mailings. Our names give complete coverage in all the industries served by McGraw-Hill publications—gives your message the undivided personal attention of the top-notch executives in the industrial firms. They put you in direct touch with the men who make policy decisions..

In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.

McGRAW-HILL PUBLISHING CO., INC.
330 West 42nd Street
NEW YORK 18, N. Y.

Here is the valve that revolutionized flow control of Sulphuric Acid . . .



HILLS-McCANNA *Saunders Patent* DIAPHRAGM VALVE *with* L-1 PLASTIC DIAPHRAGM

Sulphuric acid up to 66° Bé can now be valved without leakage, dripping or sticking . . . with Hills-McCanna Diaphragm Valves equipped with the new L-1 plastic diaphragms. This new development combines the tried and proved Saunders Patent pinch clamp principle with a diaphragm of a special type of plastic that is particularly resistant to concentrated sulphuric acid.

Hills-McCanna Diaphragm Valves with L-1 diaphragms are suitable for temperatures up to 125° F. and pressures up to 100 psi. Sizes from ¼" thru 4" are available, handwheel operated, quick opening (lever operated) and sliding stem models. Choice of nearly 50 body materials or linings including cast iron, cast steel, Durimet or glass lined.

Literature is available describing Hills-McCanna Valves with data on their use for acid and other services. Write for your copy outlining the nature of your application. HILLS-McCANNA COMPANY, 2341 W. Nelson St., Chicago 18, Ill.

The valve illustrated in cut-a-way above is the Hills-McCanna Model 2600 semi-sealed bonnet acid valve with L-1 plastic diaphragm and tell-tale travel stop indicator. Valves of this type can be furnished where particularly rigid safety precautions must be taken.

HILLS-McCANNA CO.

saunders patent

diaphragm valves

Also manufacturers of — Proportioning Pumps
Force-Feed Lubricators • Magnesium Alloy Castings

HOW DU PONT ORLON* HELPS INDUSTRY

"ORLON"

TAKES THE ACID BITE OUT OF WORK-CLOTHES COSTS

Working with carboys of sulfuric acid, the man in this picture used to ruin his clothes in a week. No fabric could withstand the cloth-eating splashes and acid fumes.

Today, the same conditions exist, but the clothing you see here has been in use for four months, and experience shows that it will be in use at least several months longer. There isn't a single acid hole in it. That's because it is made of Du Pont "Orlon" acrylic fiber, and acid resistance is one of the outstanding properties of this fiber.

Work clothing of "Orlon" offers economy through longer wear. It means comfort and efficiency to the wearer. It is light in weight—weighs half as much as the clothing used before. Work clothes of "Orlon" launder easily and are wrinkle-resistant. Such advantages suggest uses for "Orlon" in many industries—even where deteriorating chemical conditions do not exist.

Your business, too, may benefit from the unique combination of properties found in "Orlon." Besides resisting acids, this Du Pont fiber withstands the damaging effects of heat, sunlight and outdoor exposure. It has high strength, wet or dry; and good abrasion- and stretch-resistance.

Fabrics of "Orlon" have uses ranging from work clothing to awnings . . . from pneumatic filtration bags to hydraulic press cloths. Perhaps "Orlon" can help you in your business. Write E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Dept., Room N-2504C, Wilmington 98, Delaware.

*Du Pont's trade-mark for its acrylic fiber.
(Du Pont makes only the fiber . . . not the fabric or finished product.)

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

DOUBLE BARREL Advertising

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

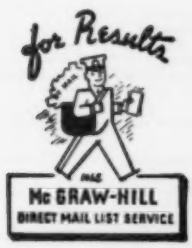
Direct Mail supplements your Display Advertising. It pin-points your message right to the executive you want to reach—the person who buys or influences the purchases.

More and more companies are constantly increasing their use of Direct Mail because it does a job that no other form of advertising will do.

McGraw-Hill has a special Direct Mail Service that permits the use of McGraw-Hill lists for mailings. Our names give complete coverage in all the industries served by McGraw-Hill publications—gives your message the undivided personal attention of the top-notch executives in the industrial firms. They put you in direct touch with the men who make policy decisions.

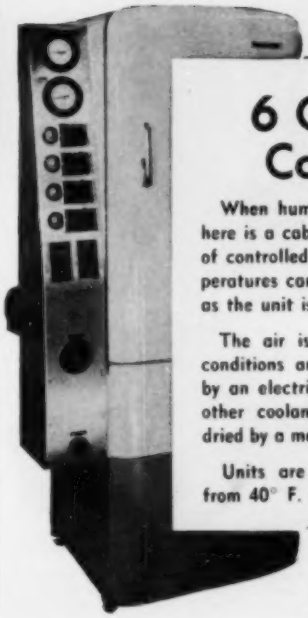
In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.



Dept. A

McGRAW-HILL PUBLISHING CO., INC.
330 West 42nd Street
NEW YORK 18, N. Y.



6 Cubic Feet of Controlled Air

When humidity and temperature are important here is a cabinet that provides about 6 cubic feet of controlled air . . . both dry and wet bulb temperatures can be maintained within 1° F. as long as the unit is in operation.

The air is constantly circulated and uniform conditions are maintained automatically; heated by an electric coil, cooled by a coil of water (or other coolant), humidified by a spray chamber, dried by a mechanical device needing no attention.

Units are available with temperature ranges from 40° F. to 140° F.

AIRE-REGULATOR
Constant Temperature and Humidity Cabinets
Now in use by many prominent laboratories in food, research, paint, pharmaceuticals, etc.—names on request.
Write for bulletin and tell us your requirements.

Food Technology, Inc.
5901 NORTHWEST HIGHWAY
CHICAGO 31, ILLINOIS

WHAT MAKES A MAILING CLICK?

Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd Street New York, 18, New York

TANK-O-METER

FOR MEASURING TANK CONTENTS ANY DISTANCE AWAY

Uehling INSTRUMENT CO.

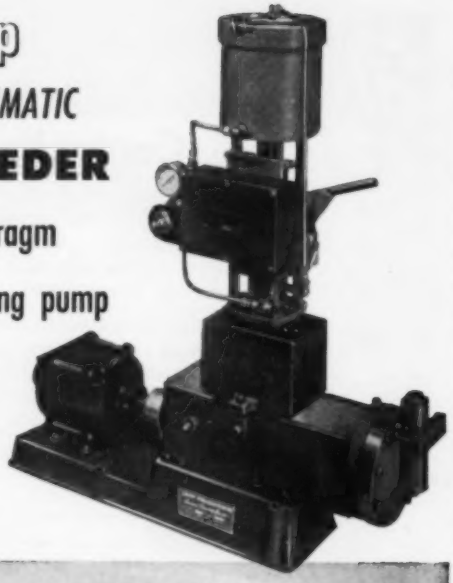
491 GETTY AVENUE • PATERSON, N. J.

SEND FOR BULLETIN 945

Lapp

AUTO-PNEUMATIC PULSAFEEDER

piston-diaphragm chemical metering pump with automatic output control



For automatic metered pumping of corrosive or "hard-to-handle" chemicals, the Lapp Auto-Pneumatic Pulsafeeder offers new accuracy, efficiency and dependability. Applicable to all pneumatic or electro-pneumatic instrumentation, the Auto-Pneumatic Pulsafeeder provides automatic metering in response to variable flow, pH, temperature, liquid level, pressure, or other processing variables. The Pulsafeeder accomplishes this with a pump that operates at a constant pumping speed; variable flow results from variation only in piston stroke length, controlled by the pneumatic cylinder. In addition, through a manual ratio control, means is provided for accurate adjustment of output rate independent of instrument air pressure changes. And the Lapp Pulsafeeder is the positive displacement proportioning pump that operates without stuffing box or running seal. Its hydraulically-balanced diaphragm acts as a floating partition which isolates the chemical being pumped from pump parts—to protect against contamination of product or equipment. Entire mechanism inherently explosion-proof.

WRITE for complete description and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 463 Maple St., LeRoy, N. Y.

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

PROFESSIONAL SERVICES 397

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
Positions Vacant 398, 399
Selling Opportunities Offered 398
Positions Wanted 398
Selling Opportunities Wanted 398
Employment Services 398

SPECIAL SERVICES
Contract Work 398

BUSINESS OPPORTUNITIES
Offered 400

PROPERTY
For Sale 400
Wanted 400

EQUIPMENT
(Used or Surplus New)
For Sale 400-408

WANTED
Equipment 400
Miscellaneous 400

ADVERTISERS INDEX

Aaron Equipment Co. 407
American Air Compressor Corp. 407

Barcan Co., Irving 408
Bauer, L. W. 402
Brill Equipment Co. 405
Brunelle Co., Charles 398

Celanese Corp., of America 399
Chemical Service Corp. 400
Consolidated Products Co., Inc. 400, 401

Drake Personnel, Inc. 398

Electric Equipment Co. 404
Equipment Clearing House, Inc. 408

Ferguson Co., Inc., The H. K. 399
First Machinery Corp. 402, 404, 406, 408

Gale, C. J. 400
Gelb & Sons, Inc., R. 403

Heat & Power Co., Inc. 406
Heineken, W. P. 406
Hercules Powder Co. 398

Kehoe Machinery Corp. 408
Kinslow Power & Equipment Inc. 400

Lawler Co. 406
Loeb Equipment Supply Co. 407
Loeb & Son, H. 404
Luria Brothers & Co., Inc. 404
Luria Steel & Trading Corp., Erman-Howell Div. 402

Machinery & Equipment Corp. 406

O'Brien Machinery Co. 400
O'Neill, A. J. 408
Opell Metal Associates 400

Perry Equipment Corp. 407
Philadelphia Transformer Co. 402

Reinertsen, A. B. 402

Stanhope, L. M. 408
Stanhope, Inc., R. C. 404
Stein Equipment Co. 408
Strickler & Assoc., Dean G. 407

Thompson Co., Inc., J. Parker 406
Truland Chemical & Engineering Co. 400

Union Carbide & Carbon Corp. 399
Union Standard Equipment Co. 402

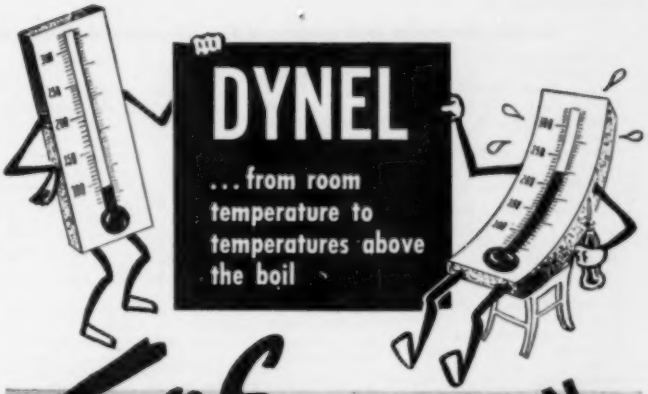
ADVERTISERS INDEX

Aerofin Corp. 236
Albert Pipe Supply Co....B296
Allegheny Ludlum Steel Corp. 60
Allen Bradley Co..... 65
Allis-Chalmers Mfg.....40, 41
Aluminum Co. of America..116
American Air Filter Co., Inc. 62
American Bitumuls & Asphalt Co. 204
American Brass Co..... 20
American Car & Foundry Co. 21
American Flange & Mfg. Co., Inc. 61
American Hard Rubber Co. 177
American Instrument Co..248
American Mach. & Metals Inc., Tolhurst Div.....214
American Metal Hose.... 30
American Metal Spinning & Stamping Co.....RB382
American Optical Co..... 12
American Tool & Machine Co. 217
Amercoat Corp. 55
The Annin Co. 114
Anthracite Equip. Corp...206
Arnold-Hoffman & Co., Inc. LT381
Arrow-Hart & Hegeman Elec. Co. 71-72
Atlas Mineral Products...268
Atlas Powder Co.....92, 312
Automatic Switch Co.....T256
Babcock & Wilcox Tube Co. 32-33

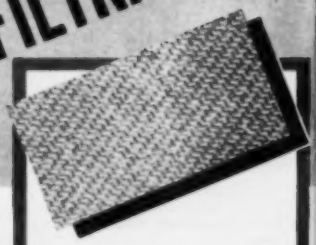
Bailey Meter Co..... 16
Baird Associates Inc.....224
Baker & Company 52
Baker Perkins Inc.....127
Barrett Div., Allied Chemical & Dye Corp.....349
Beckman Instruments Inc.314
Bell & Gossett Co..... 69
Bemis Bros. Bag Co.....329
Berkworth Chemical Co... 58
Bethlehem Steel Co..... 49
Bird Machine Co..... 9
Black Sivalls & Bryson Inc.366
Blaw-Knox Co. 21
Blickman Inc., S.....257
Blockson Chem. Co.....305
Boston Woven Hose & Rubber Co. 70
Bridgeport Brass Co.....374
Bristol Co. 52
Brown & Root Inc.....221
Buffalo Forge Co.....321
Buflovak Eqpt. Div. of Blaw-Knox 378
Builders-Providence Inc...258
Butler Mfg. Co.....119

Cambridge Wire Cloth Co. L385
Camco Products Inc.....R389
Cameron Iron Works..... 82
Carbide & Carbon Chemicals Corp. 6
Carpenter Steel Co..... 99
Carrier Corp. 88
Cash Co., A. W..... 8
Celanese Corp. of America.375
Century Electric Co.....315
Chapman Valve Mfg. Co... 67
Chemical Construction Co., Inc. 84
Chemical Corp. 226
Chemsteel Constr. Co., Inc.396
Chicago Bridge & Iron Co. 30

Continued on Page 418



Tops for broad-range CHEMICAL FILTRATION



Dynel is an excellent general purpose filter cloth. It is available in twill, chain and plain weaves. Dynel can be woven in widths from 26" to 72" and can be supplied as made up filter element covers. In addition to its high degree of resistance to many chemicals (see box at right) Dynel is not affected by mildew or other fungi and has outstanding dimensional stability.

Over forty years of weaving experience have given us the "know how" so necessary to the production of top quality Industrial Filtering Fabrics. We weave all these synthetic fibers in our own plant: Glass, Nylon, Vinyon N*, Saran, Vincel, Orlon† acrylic fiber, and Dynel.**

Write us about your requirements. We'll be glad to send you test samples and to give you the benefit, without obligation, of the knowledge we have accumulated in our many years of servicing the processing field.

*TM — UCC
**TM — NFMC (applied for)
†TM — E. I. du Pont de Nemours

DYNEL shows excellent resistance to many chemicals, including the following:

- Acetic Acid
- Formic Acid
- Sulphuric Acid
- Hydrochloric Acid
- Nitric Acid
- Phosphoric Acid
- Sodium Hydroxide
- Sodium Bichromate
- Ferric Nitrate
- Zinc Chloride

Weavers of Industrial Filter Media for over Forty Years

NFM **The National Filter Media Corp.**

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill.	Cincinnati, Ohio	Houston, Texas	Oslo, Norway	Johannesburg, South Africa
2627 West 19th St.	Roselawn Center Bldg.	1406 Second National Bank Bldg.	Nicolai Friis	Edward L. Bateman

Continued from 417

For more information about products of these advertisers, use Reader Service postcard in section following

Cleaver Brooks Co.....318
Cochrane Corp. 344
Corning Glass Works....347
Cowles Co. R384
Crane Packing Co.....241
Crane Co. 182, 215
Crucible Steel of America. 45
Cyclotherm Steam Generators 52

Darco Dept. Atlas Powder Co. 312
Darling Valve & Mfg. Co..285
Darnell Corp., Ltd.....L382
Davis Engrg. Corp.....T278
Davis Regulator Co.....326
Davison Chemical Corp. .255
Day Co., The L384
DeLaval Separator Co..... 87
DeLaval Steam Turbine Co. 101
Deming Co. R379
Dicalite Div.—Gt. Lakes Carbon Corp. 102
Dodge Mfg. Co..... 86
Dorr Co. 196-197
Dow Chemical Co., The 130-131, 290, 331
Dracco Corp. L386
E. I. Du Pont de Nemours & Co., Inc.....311, 414
Duraloy Co., The.....L382
Durametallic Corp. 274
Duriron Co., Inc.....267

Ebert Electronics Co....B358
Electric Steel Fdry..... 17
Elliott Co. 18-19
Enjay Co., Inc..... 74
Esso Standard Oil Co..... 68

Falls Industries 309
Fansteel Mat. Corp.....R385
Farrel-Birmingham Co. Inc. 330
Fenwal Inc. 92
Filtration Engineers, Inc..263
Fletcher Works B298
Floridin Company 246
Fluid Systems Inc.....28-29
Fluor Corp. Ltd., The.....342
Food Technology.....415
Foote Bros. Gear & Machine Corp. 100
Foster Wheeler Corp.....122
Foxboro Co. 409
Friez Instru. Div. of Bendix-Aviation Corp..T334
Fuller Co. 91
Fulton Syphon Co.....235

Garlock Packing Co., The.348
General Amer. Trasp. Corp.181
General Chem. Div. Allied Chem. & Dye Corp.....111
General Electric Co.....26-27, 35-38, 247, 292-293
The Girdler Corp.....309
Globe Steel Tubes Co.....93
The B. F. Goodrich Co....13
B. F. Goodrich Chemical Co. 7
Goodyear Tire & Rubber.. 17
Gould Pumps Inc.....316
Graphite Metallizing Corp.R386
Graver Water Conditioning Co. 96
Grinnell Co., Inc.....122
Griscom-Russell Co. 94

Hagan Corp. 117
Hammel Dahl Co..... 6
Harbison-Walker Refractories Co. 108-109
Hardinge Co., Inc.....288
The H. M. Harper Co....B334
Harshaw Chemical Co.... 14
Havog Corp. 303
Heinkeken Inc., W. P.....396
Helicoid Gage, Div. Amer. Chain & Cable.....234
Hensley Co. L296
Hercules Powder Co.....392
Heyden Chemical Corp....203
Hills McCanna Co.....R413
Homestead Valve Mfg. Co. 41
Hooker Electrochemical Co.371
Howell Electric Motors Co., Inc. 90

Illinois Electric Porcelain Co. 224
Ind. Filter Pump Mfg. Co..310
Ingersoll-Rand 239
Instruments Inc. RT380
Ivs. Engrg. Inc.....136
Int. Minerals & Chem. Corp.103
Int. Nickel Co.....46, 352
International Paper Co..... 47

Jarecki Valve Div. of H. K. Porter Co., Inc.....287
Jeffrey Mfg. Co..... 95
Jelliff Mfg. Co.....T300
Jenkins Brothers 279
Jerguson Gage & Valve Co. L287
Johns-Manville .125, 201, 332
Johnson Corp., The....LB381
Joy Mfg. Co.....259

Kay Co. 97
Kemp Mfg. Co.....327
Kidde & Co., Walter.....202
Kinney Mfg. Co.....223
Kirk & Blum Mfg. Co....R383
Kold-Hold Mfg. Co.....289
Koppers Co. Inc.....133
Koppers Co., Inc., Chem. Div. L410

La Bour Co., Inc.....245
Lapp Insulator Co., Inc..L416
Layne & Bowler Inc.....297
Lee Metal Products Co..T272
Leeds & Northrup Co.....358
Lessmann Mfg. Co.....B284
Link Belt Co.....11, 57
Liquid Carbonic Corp....L386
Liquidometer Corp. LT390
Lukens Steel Co.....356
Lukenheimer Co. 295
R. C. Mahon & Co.....115

Manhattan Rubber, Div. of Raybestos-Manhattan Inc. 344
Manheim Mfg. & Belting Co. 44
Master Electric Co..3rd Cover
Mathieson Chemical Co...113
McGraw-Hill Book Co. R393, R391
Mechanical Equip. Co., Inc.359
Mercoid Corp. LB379
Merlin Instrument Co...R411
Merrick Scale Mfg. Co....396
Metal Glass Products Co. RT387
Metal Textile Corp.....T270
Metalweld, Inc. 396
Michigan Pipe Co. R390
Midwest Piping & Supply Co., Inc. 113
Minneapolis-Honeywell Reg. Co., Industrial Div. 42-43, 219
Mitchell & Co., Inc., W.LT389
Mixing Equipment Co., Inc.135
Monarch Mfg. Works, Inc.R388
Monsanto Chemical Co.128-129
Morris Machine Works....222
Mundet Cork Corp.....L393

Nash Engrg. Co.....360
National Carbon Co., Inc..265
National Engr. Co.....243
National Filter Media Corp. R417
National Lead Co.....237
Naugatuck Chem. Div. of U. S. Rubber Co.....355
Neptune Pump Mfg. Co.LT396
Neville Co., The.....283
Newark Wire Cloth Co..R381
Niagara Blower Co.....394
Niagara Filter Co.....357
Nicholson & Co., W. H....187
Nordstrom Valve, Div. Rockwell Mfg. Co..... 39
Norton Co. 362
Norwalk Co., Inc..... 4

Ohio Injector Co..... 89
Oliver United Filters Inc..365
Omega Machine Co....RB376
Oronite Chemical Co.....362
Owens-Illinois Glass Co...367

Pacific Pumps Inc.....297
Pangborn Corp. 276-277
Parker Appliance Co..226-227
Patterson-Kelley Co., Inc..369
Peerless Mfg. Co.....T284
Penberthy Injector Co.....364
Penn. Flex Tubing Co....368
Permutit Co. 329
Petro-Chem. Development Co. Inc. L412
Pfaudler Co. ....Back Cover
Pfizer & Co., Inc., Chas...338
Phila. Gear Works..... 54
Pitts. Coke & Chemical Co.323
Pitts. Corning Corp.....373
Pitts. Lectrodryer Corp...352
Pitts. Lectromelt Furnace Corp. 291
Porter Co., Inc., H. K....287
Potts Horace, T. Co.....370
Powell Co., Wm.....34, 354
Prater Pulverizer Co...RB357
Pressed Steel Co.....T289
Pritchard, J. B. & Co...B270
Proportioneers, Inc. 107
Prufcoat Labs Inc.....269
Powers Regulator Co.....275

Quaker Oats Co.....328
Quaker Rubber Corp.....233

Raybestos-Manhattan Inc. (Manhattan Rubber Div.) 344
Raymond Pulverizing Div., Combustion Engrg. Co..216
Read Standard Corp....R377
Reading Pratt & Cady Div. of Amer. Chain & Cable.272
Reeves Pulley Co.....231
Republic Flow Meters Co..361
Republic Rubber Div. Lee Rubber & Tire Corp.....367
Republic Steel Corp..... 15
Revere Copper & Brass Inc. 10
Rietz Mfg. Co.....R394
Roosevelt Oil & Refining Corp. 271
Roots-Connersville Blower Corp. 191
R-S Products Corp.....372
Ryerson & Son Inc., J. T..138

Safety Car Heating & Lts. Entoleter Div. 225
Saranlined Pipe Co...290, 331
Sarco Co., Inc.....132
Schmieg Industries Inc..B272
Schneible Co., Claude B..B289
Schutz-O'Neil Co. RB380
Sharples Corp. 365
Shriver & Co., T.....B274
Sier-Bath Gear & Pump Co., Inc. LB390
Simpson Mix-Muller Div..243
The W. W. Sly Mfg. Co...208
Snap-on Tools Corp.....194
Solvay Sales Div., Allied Chem. & Dye Corp.....249
Sparkler Mfg. 252-253
Spraying Systems Co..RT376
Sperry & Co., D. R..... 58
Sprout Waldron Co.....R385
Standard Conveyor Co..LB389
Standard Oil Co.....302
Standard Steel Corp....RT382
Stanley Co., Inc., Wm. W. LT379
Sterling Electric Motors...301
Stokes Machine Co., F. J..351
Sturtevant Mill Co.....203
Submerged Combustion Co. LT388
Superior Combustion Corp. RT396
Surface Combustion Corp..286
Swenson Evaporator Co.... 22
Synton Co. B300

Taber Pump Co.....T298
Tank Car Div., Gen. Amer. Transp. Corp. 181
Taylor Instrument Co.134-135
Taylor Forge Pipe Works..299
The Timken Roller Bearing Co. 251
Tolhurst Centrifugal Div. Amer. Machine & Metals, Inc. 214
Trane Co., The..... 73
Traylor-Engrg. & Mfg. Co. 62
Trent Tube Co.....124
Tri-Clover Machine Co....335
Tube Turns Inc....2nd Cover

Uehling Instrument Co....415
Union Bag & Paper Co....341
Union Carbide & Carbon Corp. 8
U. S. Electrical Motors Inc. 345-346
U. S. Casket Co.....240
U. S. Rubber Co..... 76
U. S. Steel Co.....120-121
U. S. Stoneware Co.....104

Victor Chemical Works....205
Viking Pump Co.....LT391
Visking Corp. 189
Vogt Machine Co., Henry.. 75
Vulcan Iron Works..... 66

Wall Colmonoy Corp.....260
Walworth Co. 85
Water Cooling Equip. Co..325
The Welsbach Corp.....350
Westinghouse Electric Corp. 24-25, 50-51, 126
Westinghouse Electric Corp. Sturtevant Div.... 78
Weston Elec'l Instr. Corp 306
Wiegand Co., Edwin L....261
Wigton-Abbott Corp. 56
Wilfley & Sons, A. R.....337
Williams Patent Crusher & Pulv. Co. 64
Wilson Products Inc.....195
Wilson, Inc., Thomas C..L376
Winslow Scale Co.....R392
Wolverine Tube Div., Calumet & Copper Co...193
Workion Inc. 313
Worthington Pump & Mach. Corp. 77
Wyandotte Chem. Corp.23, 81

Yarnall Waring Co. B278, LB 391

FOR CLASSIFIED INDEX SEE PAGE 416

Chemical Engineering Reader Service

HOW IT WORKS

Mail the post card below. Before mailing, circle page numbers of items about which you want more details. Then write your name and address on other side of card and mail to us. Your requests will be forwarded to companies concerned, the answer coming direct to you.

TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are two indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised. The index of advertisers is on the proceeding page.

NUMBERS EXPLAINED

Advertisements:—There is a page number on the postcard for each advertisement. Before the number, may appear, L, R, T, B (left, right, top, bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items:—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

EDITORIAL ITEMS

For more data, circle item number on postcard.

NEW PRODUCTS

	Page
Aconitic Acid	199A
Alkyl Phosphates	199C
Herbicide	202B
Neoprene Cement	199B
Silage Preservative	204A
Soil Solidifier	200B
Soil Stabilizer	198A
Surface Active Agents	200A
Vulcanizing Agent	202A

NEW EQUIPMENT

	Page
Adjustable Speed Motor	182D
Asphaltic Coating	191C
Bag Closing Machine	186A
Centrifugal Contactor	179A
Centrifugal Pump	188H
Chrome Carbide	190C
Classifying Scale	186B
Compression Evaporator	180D
Compressed Fuel Torch	195A
Condensate Return Unit	195B
Continuous Kneader	180E
Control Unit	192B
Conveyor Curve	186E
Dehydrator	180A
Dry Solids Blender	178A
Electric Oven	196A
Electric Oven	196B
Electric Stopwatch	192G
Electric Truck	186H
Emergency Showers	184A
Extension Collar	179B
Filling Scale	186C
Fire Detector	184C
Flow Colorimeter	192I
Forced Draft Burner	194E
Gas Turbine	182N
Heating Mantle	194F
Instrument Drive	182H
Instrument Winder	192H
Insulation Tester	182E

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

2	22	43	66e	86b	100e	116	128–129m	137	214	243	267b	283	290	316a	338	356	374	L383	TL391
4a	23	47	66d	91	101	117	128–129n	139	216	244	268a	T284	T300	316b	341	357	375	R383	BL391
4b	24–25	48	66e	92	102	118	130–131	191	216	245	268b	B284	B300	317	343	358	L376	L384	L392
5	26–27	49	66f	93	103	119	132	193	219	246	269e	285a	301	318	344	359	TR376	R384	R392
6	28–29	50–51	67a	94	104a	120–121	133	194	221	247	269	285b	302a	321	345–346	361	BR376	L385	L393
7	30	52	67b	95	104b	122	134–135	195	223	248a	T270	286	302b	323	347	362	R377	R385	L394
8a	31	53	67c	96	107	123	136a	196	224	248b	B270	287	302c	324	348a	363	378a	L386	R394
8b	32–33	54	67d	97	108–109	124	136b	197a	225	251	271	288	303	325	348b	364a	378b	R386	395
8c	34	55	68	98	111	125	136c	197b	226	252–253	T272	T289	305	326	349	364b	TL379	L387	TL396
8d	35–35a	56	69	99	113a	126	136d	197c	227	255	B272	B289	306a	327	350	364c	BL379	TR387a	TR396
9	35–35b	57	70	99a	113b	127	136e	197d	229	T286	273	290	306b	328	351a	364d	R379	TR387b	409
10	35–35c	58	71–72a	99b	113c	128–129a	136f	197e	231	B258	T274	291	306c	329	351b	365a	L380	BR387	L410a
11	36a	59	71–72b	91	113d	128–129b	136g	197f	232	257	B274	292–293a	307	330	351c	365b	TR380	TL388	L410b
12	36b	61	71–72c	92	113e	128–129c	139	197g	233a	258	275	292–293b	308	331	351d	366	BR380	BL388	R411
13	36c	62	71–72d	93	113f	128–129d	177	201	233b	259a	276	292–293c	309a	332	353	367	TL381	R388	L412
14a	39d	63	73	94	113g	128–129e	181	202	233c	259b	277a	292–293d	309b	T334	353	368	BL381	TL389	R413
14b	39e	64	74	95	113h	128–129f	183	203	234	259c	277b	292–293e	310a	B334	354a	369	R381	BL389a	414
15	39f	65a	75	95	114a	128–129g	185a	204	235	260	277c	295	310b	335a	354b	370	L382a	BL389b	T415
16	39g	65b	76	97	114b	128–129h	185b	205	236	261	277d	T296	312	335b	354c	371	L382b	R389	416
17	40	65c	77	98	114c	128–129i	185c	208	237	262	T278	B296	313	335c	354d	372a	TR382	TL390	L417
18–19	41	65d	78	99	115a	128–129j	185d	207	239	263	B278	297	314	335d	354e	372b	BR382a	BL390	419
20	42–43	66a	79	100a	115b	128–129k	185e	206	240	265	279	T298	315a	335e	354f	372c	BR382b	R390	420
21	44	66b	80a	100b	115c	128–129l	185f	209	241	267a	280	B298	315b	337	355	373			

Editorial Items

178A	180D	182F	182M	186C	186J	188G	191A	192B	192I	194E	198A	202A	206D	206J	207C	207I	207F	208E	208K
178B	180E	182G	182N	186D	186A	188H	191B	192C	192J	194F	199A	202B	206E	206K	207D	207J	207Q	208F	208L
179A	182A	182H	194A	186E	186B	188I	191C	192D	194A	198A	199B	204A	206F	206L	207E	207K	208A	208G	208M
179B	182B	182I	184B	186F	188C	188J	191D	192E	194B	198B	199C	206A	206G	206M	207F	207L	208B	208H	208N
180A	182C	182J	184C	186G	188D	190A	191E	192F	194C	198A	200A	206B	206H	207A	207G	207M	208C	208I	208P
180B	182D	182K	186A	186H	188E	190B	191F	192G	194D	198B	200B	206C	206I	207B	207H	207N	208D	208J	208Q
180C	182E	182L	186B	186I	188F	190C	192A	192H											

Card Expires April 15

	Page
Insulation Tester	182F
Intensive Mixers	180C
Lead-Clad Copper	191F
Lined Paper Bags	186D
Load Cell	194C
Magnetic Flowmeter	192A
Magnetic Starters	182G
Mass Spectrometer	192D
Molding Press	178B
Package Printed	186I
pH Indicator	194A
Plastic-Covered Bolts	191D
Plastic Liner	190B
Plastic O-Rings	182J
Porous Cobalt Alloy	191A
Position Switch	182G
Pressure Transmitter	194D
Reagent Pump	188A
Refractory Coating	191E
Roof Ventilator	188D
Safety Shoes	184B
Scanning System	192J
Single-Stage Turbine	182M
Small Volume Pump	188B
Speed Indicator	192K
Stacker Truck	186F
Steam Cleaning Unit	182A
Steam Jet Cleaners	182B
Steel Blowers	188E
Steel Chutes	186G
Steel Tubing	188I
Steel Valves	188J
Suction Line Strainer	188G
Sump Pump	188F
Surface Thermometer	192C
Tank Bushing	188C
Temperature Regulator	192F
Tenite Pipe	190A
Universal Clamp	186J
Universal Vise	182I
Valve Positioner	194B
Voltage Regulator	182L
Water Treating Process	180B
Welding Guns	191B
Wet Blast Machine	182K

NEW TECHNICAL LITERATURE

	Page
Alloys	204J
Alloys	207I
Alloys	208C
Ceramics	207G
Chemicals	208F
Closures	206B
Coatings	208J
Cold Rubber	207P
Condenser Tubes	207N
Conveyors	206H
Fans	208B
Fungicides	207E
Gages	207Q
Gas Diffuser	206G
Hammer Mills	207K
Heat Exchangers	206K
Industrial Coatings	207C
Instrumentation	207A
Instruments	206A
Instruments	206F
Instruments	207H
Instruments	207L
Instruments	208D
Instruments	208G
Instruments	208H
Instruments	208Q
Ion Exchange	206I
Lighting	206D
Lubricants	207J
Materials Handling	208M
Mills	206C
Phthalocyanine Blue	207B
Pipe	207P
Process Equipment	206L
Pumps	207M
Pumps	208E
Pumps	208P
Pumps	208K
Reagents	208N
Safety Clothing	208I
Scrubbers	207D
Sodium	208B
Solvents	206E
Thickeners	208A
Valves	208A

PRODUCTS ADVERTISED

For more data, circle item number on postcard.

Air cleaning equipment	Page
Air & fume centri-merge	B272
Blast cleaning cabinets	277a
Blast cleaning machines	277b
Dust collectors	276
Dust collectors, hydro-foam	115b
Dust collectors, jet type	115c
Dust collectors, unit	277c
Dust controllers	L380
Dust filters	L384
Dust filters, bulletin 38	208
Fog-filters	115a
Fume-eliminating roto-clone	62
Hydro-finish cabinets	277d
Mist eliminators	T270
Multi-wash	B289
Air handling, conditioning & cleaning equipment	78
Apparel, industrial, orlon	312
Barges, submersible oil tank battery	49
Beakers, stainless steel	RB382a
Bearings	
Oilless	R386
Roller & thrust, replacements for rotary kilns	66d
Roller supporting, four roller replacement	66e
Triple-sealed	86
Belts	
Conveyor, rotocured	70
Conveyor, woven wire	L385
Grommet	13
Rubber, V or flat	223c
V, adjustable, link and endless	44
V, bulletin 4568-E	344
Blowers	
Centrifugal and rotary positives types	191
Continuous service	R377
Boilers, steam	318
Boosters, gas pressure	259c
Buildings	119
Burners, gas, direct-fired, circular 52	TL388
Calculators, vacuum	351d
Casters & wheels	L382
Castings, high alloy	L382a
Cements, corrosion-proof, bulletin 5-2	268b
Centrifugals	97, 263
Continuous	317
Link-suspended type	214
Suspended	312
Suspended, motor-driven	B298
Chemicals	
Alcohol ester-1, bulletin P-140.128-129m	
Aliphatic naptha	271
Alumina	116
Ammonia	113c

Page

Benthal 128-129b
Benzene, hexachloride 113h
Benzyl chloride 128-129l
Carbon dioxide L386
Caustic soda 81, 112a
Cellosolve, methyl and butyl 5
Chlorine 113b
Citric acid anhydrous 338
Coal-tar 349
Copper 8-quinolinolate-T milmer No. 1 progress report 128-129k
Desiccants 246
Detergent and detergent-promoter, Kreelon C-D 23
Detergents
Emulsifiers, H. L. M & R, bulletin P-142 ..... 128-129l
MXP, bulletin P-122 ..... 128-129h
Santomerse D, S, No. 3, bulletin P-123 ..... 128-129d
Santomerse S, bulletin P-146 ..... 128-129j
Santomerse No. 1, booklet 128-129c
Sterox CD bulletin P-129 ..... 128-129e
Sterox SE & SK, bulletin P-132 ..... 128-129f
Sterox No. 5 & No. 6 bulletin P-136 ..... 128-129g
Di-tert-butyl-para-cresol L410a
Fine, industrial TL381
Formaldehyde 375
Furafil 328
Glycols 130-131
Heavy, for soap-and-detergent industry 371
HR-40 bulletin P-140 ..... 128-129n
HTH Hypochlorite products 113d
Hydrazine products 113g
Impruvol 20 ..... L410b
Industrial 14a
Nitric acid 111
Oxygenated solvents & chemicals 74
Phosphorus, elemental 205
Polyhydric alcohol, Pentek 203
Potash 103
Resins, geon 404 7
Silica gel, grade 19 255
Sodium chlorite products 113e
Sodium methylate 113f
Sodium phosphates 205
Solvents, petroleum 68, 283
Sorbitol 98
Styrene copolymer, Kralastic D-Ivory 85%

Page

Surface active agents 262
Toluenesulfonic acid 128-129a
Versenes, bulletin 2 58
Clad steels 358
Closures, drum, tri-sure 61
Coatings
Protective
Bitumastic 133
Corrosion-proof, bulletin 268c
Enamel, tar base 323
Primer P-50 269
Royalguard 76
Rubber-base paints L392
Tygon 104b
Compressors
Centrifugal 88
Four stage, tandem 4b
Four stage, vertical 4a
Oil-free 259a
Concentrators, high-temperature 84
Containers
Bags
Multiwall 341
Multiwall paper 329
Conveying system with portable pump and pneumatic conveyor 91
Conveyors
Belt and line roller BL389b
Bulk handling, pneumatic 395
Bulk materials handling 57
Power-belt BL389a
Screw 11
Disintegration equipment
Ball mills 136e
Ball mills, conical 288
Ball mills, continuous conical 136f
Crushers, rotary line 303
Disintegrators, RDH-18 ..... H394
Grinding mills 63
Hammermills 64
Imp mills, catalog 67 216
Pulverizers BR380
Drives, electric power, sped-trol 301
Dryers
Air & gas dehydrating B270
Bulletin 503 ..... TH382
Drum
Atmospheric 278a
Vacuum 278b
Spray 22
Storage-space 352
Ejectors
Air, water or steam jet, bulletin 512 ..... 364d

Page

Steam jet 18-19, 77
Elevators, bucket 95
Engine rings, high alloy L382b
Engineering & construction
Chemical plants 21
Fatty acid distillation plants 122
Hydrogen plants 209
Packaged plants 56
Plants in Southwest 221
Evaporators, thermocompression 359
Exhausters, rubber-lined, bulletin 2424-E 321
Fabricators
Pipe T289, B296
Sheet metal assemblies R383
Stainless steel equipment 257
Fabric fibers, orlon 414
Fastenings, corrosion-resistant B354
Feeders
Chemical, solution, dry materials BR376
Rotary, airlock BR387
Vibratory B300
Visible flow chlorinizer 258
Filter aids, bulletin B-12 102
Filter aids & mineral filler, celite 201
Filter media
Carbon activated, Darco G-60 312
Cotton & synthetic fabrics TL379
Dynel 417
Hard coal 206
Filter presses 59, B274
Filters
High solid capacity, style H, bulletin H-1051 357
Horizontal plate 252-255
Industrial, bulletin 100-CPI 310a
Panel 365b
Precoat 365a
Rotary vacuum, string discharge bulletin 103 263
Slurry 9
Fire extinguishing systems, carbon dioxide 202
Fittings & flanges, data sheet 299
Fittings
Conical, clamp-type 335c
Conical end, catalog 848 ..... 335e
Corrosion-resistant, catalog 370
Recessed-end, catalog 948 ..... 355b
Sanitary type, catalog 150-B 335d
Stainless steel R389
Triple-lock, leak proof 227

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

2	22	45	66e	86b	100c	116	128-129m	187	214	242	267b	283	289	316a	336	356	374	L383	TL391
4a	23	47	66d	91	101	117	128-129n	189	215	244	268a	T284	T300	316b	341	357	375	R385	BL391
4b	24-25	48	66e	92	102	118	130-131	191	216	245	268b	B284	B300	317	343	358	L378	L384	L392
5	26-27	49	66f	93	103	119	132	193	219	248	268c	285a	301	318	344	359	TR376	R384	R392
6	28-29	50-51	67a	94	104a	120-121	133	194	221	247	269	285b	302a	321	345-346	361	BR378	L385	L393
7	30	52	67b	95	104b	122	134-135	195	223	248a	T270	286	302b	323	347	362	R377	R385	L394
8a	31	53	67c	96	107	123	136a	196	224	248b	B270	287	302c	324	348a	363	378a	L386	R394
8b	32-33	54	67d	97	108-109	124	136b	197a	225	251	271	288	303	325	348b	364a	378b	R386	395
8c	34	55	68	98	111	125	136c	197b	226	252-253	T272	T280	303	326	349	364b	TL379	L387	TL396
8d	35-36a	56	69	99	113a	126	136d	197c	227	254	B272	B280	304a	327	350	364c	BL379	TR387a	TR396
9	35-36b	57	70	99a	113b	127	136e	197d	229	T255	273	290	304b	328	351a	364d	R379	TR387b	409
10	35-36c	58	71-72a	99b	113c	128-129a	136f	197e	231	B256	T274	291	304c	329	351b	364e	L380	BR387	L410a
11	39a	60	71-72b	91	113d	128-129b	136g	197f	232	257	B274	292-293a	307	330	351c	364b	TR380	TL388	L410b
12	39b	61	71-72c	92	113e	128-129c	138	197g	233a	258	275	293-293b	308	331	351d	366	BR380	BL388	R411
13	39c	62	71-72d	93	113f	128-129d	177	201	233b	259a	276	293-293c	309a	332	352	367	TL381	R388	L412
14a	39d	63	73	94	113g	128-129e	181	202	233c	259b	277a	293-293d	309b	T324	353	368	BL381	TL389	R413
14b	39e	64	74	95	113h	128-129f	183	203	234	259c	277b	293-293e	310a	B324	354a	369	R381	BL389a	414
15	39f	65a	75	96	114a	128-129g	185a	204	235	260	277c	295	310b	335a	354b	370	L382a	BL389b	T416
16	39g	65b	76	97	114b	128-129h	185b	205	236	261	277d	T298	312	335b	354c	371	L382b	R389	418
17	40	65c	77	98	114c	128-129i	185c	206	237	262	T278	B298	313	335c	354d	372a	TR382	TL390	L417
18-19	41	65d	78	99	115a	128-129j	185d	207	239	263	B278	297	314	335d	354e	372b	BR382a	BL390	419
20	42-43	66a	79	100a	115b	128-129k	185e	208	240	265	279	T296	315a	335e	354f	372c	BR382b	R390	420
21	44	66b	80a	100b	115c	128-129l	185f	209	241	267a	280	B296	315b	337	355	373			

Editorial Items

178A	180D	182F	182M	186C	186J	188G	191A	192B	192I	194E	198A	202A	206D	206J	207C	207I	207P	208E	208K
178B	180E	182G	182N	186D	188A	188H	191B	192C	192J	194F	199A	202B	206E	206K	207D	207J	207Q	208F	208L
179A	182A	182H	184A	186E	188B	188I	191C	192D	194A	195A	199B	204A	206F	206L	207E	207K	208A	208G	208M
179B	182B	182I	184B	186F	188C	188J	191D	192E	194B	195B	199C	204A	206G	206M	207F	207L	208B	208H	208N
180A	182C	182J	184C	186G	188D	190A	191E	192F	194C	196A	200A	206B	206H	207A	207G	207M	208C	208I	208P
180B	182D	182K	186A	186H	188E	190B	191F	192G	194D	196B	200B	206C	206I	207B	207H	207N	208D	208J	208Q
180C	182E	182L	186B	186I	188F	190C	192A	192H											

Page

Welding 2, 118
Welding, alloy steel 97
Zephyrweld, catalog 784 ..... 235a
Fittings & valves, drop forged, catalog F-9 73
Fluid handling systems, self-heating pipelines for wax processing 28-29
Furnaces, smelting, bulletin 194 291
Gaskets
Heat exchanger 240
Heat exchanger, goetze 125
Teflon 248b
Gear drives,
Straight line, bulletin LPB 100a
Worm gear, horizontal or vertical, bulletin HGB 100c
Gear motors, bulletin GMA 100b
Gear rings, cast-steel, replacements 66a
Generators
Inert gas, bulletin 1-10 227
Steam 53
Steam, catalog 322 ..... TH296
Gilsonite 261
Glass, plate, heat-resistant 247
Hard facing alloys, spray welding 260
Heat exchangers 238
Heat exchangers
Aero, bulletin 120 ..... L394
Automatic, self cleaning T278
Brazed aluminum 73
Impervious graphite 309a
Twin G-fin section, bulletin 1614 94
Heaters
Electric, automatic 261
Tantalum, acid-proof R385
Heating installations, iso-flow L412
Hose
Metal, flexible 80a
Rubber 233b
Rubber, acid-handling 17
Rubber, creamery 267
Humidity control systems 286
Instruments
Analyzers, plant stream, bulletin 26 224
Control, pilot-plant tested 42-43
Controllers
Bi-act 134-135
Mercury-switch equipped BL378
Differential relay, type 6000 ..... TH380
Electrical measuring voltmeters & ammeters 82
Flow and pressure ring balance meters 117

Page

Flow measuring d/p cell mercury-less 409
Flow meters, indicating T296
Gages
Liquid level 364a
Pressure, helicoid 224
Tank TL396
Transparent, catalog 25 ..... 364b
Vacuum 351b
High-voltage controllers, limitamp bulletin GEA-5469A 247
Illuminators, gage L387
Kiln control systems 16
Manometers, dual-tube R411
Motor controls, type "RA" 71-72d
Motor starters
Explosion proof 71-72b
Multi-speed, reversing 71-72c
Push button control station, interchangeable 71-72a
Relays, mercury, plunger type R256
Spectrophotometers 314
Tank meters, bulletin 945 ..... BL388
Temperature co-efficient ceramic resistors T334
Temperature & humidity regulating cabinets T415
Temperature measuring speedomax 358
Testing, bulletin GEA-5469 ..... 292-293d
Thermometers
Contact making 306b
Maximum-minimum 306c
Standard 306a
Thermostats, multi-purpose 92
Transmitters, pneumatic, data book 1002 361
Insulations
Asbestos & selected raw materials 332
Cellular glass 373
Heat, Kaylo 307
Heat, 85% magnesia L393
Kettles, corrosion-resistant T272
Kiln-shell sections, replacements 66f
Laboratory apparatus, chemical 14b
Linings
Corrosion-proof, bulletin 4-2 ..... 268a
Sheet, flexible thermoplastic 85
Tank, rubber 290
Liquid handling systems, porcelain, catalog C-3 324
Lubricants
Greases, superia 302b
Industrial oils, stanoil 18 ..... 320a

Page

Materials of construction
Alloy steels 251
Clad steels 256
Copper 10
Copper & copper alloys 26
Fiberglas resin-bonded 228
Glass, alkali-resisting 420
Lead sheets 237
Nickel alloyed bronze for bearings 302
Rubber for tank, etc., linings 177
Stainless steel 15, 45
Stainless steel for carbon black recovery equipment 120-121
Stainless steel, No. 20 99
Steel 138
Tygon 104a
Mixing equipment
Agitators, turbine 136a
Blenders
Dry 136d
Twin shell 369
Dissolvers R384
Mixers
Centrifugal 225
Condensed catalog B-100 ..... 185e
Laboratory, bulletin DH-50 ..... 185d
Portable 136b
Portable, bulletin B-75 ..... 185f
Ribbon 136g
Series E, bulletin B-102 ..... 185a
Side-entering 136c
Side entering, bulletin B-78 ..... 185b
Top entering, bulletin B-74 ..... 185c
Vacuum, type T 127
Muller-type for uniform catalyst production 243
Motor training manual, bulletin GEZ-310 ..... 292-293e
Motors
Chemical, booklet B-4687 24-25
Controls
Solenoid, bulletin 709 ..... 65d
Speed regulators, bulletin 555 ..... 65c
Starters, auto transformer, bulletin 646 ..... 65a
Starters, automatic, bulletin 746 ..... 65b
General line 419
Hammermill driving 315a
Model 4-B, jigmil 90a
Synchronous
Double-duty, bulletin, GER-234 ..... 292-293a
High-speed, bulletin GEA-5426 ..... 292-293c

Page

Low-speed bulletin GEA-5333 ..... 292-293b
Totally enclosed
Explosion-proof 345-346
Fan cooled 26b, 215b
Fan cooled, bulletin GEA-4131 26-27
Fan cooled, bulletin 51B7225 40
Packaging equipment, bag closer, booklet 280E 47
Packaging materials, polyethylene film 189
Packings
Flexible metal, bulletin 429CE T274
Ebonite sheet 232a
Teflon 348a
Tower, metal 46
Pipe
Steel, saran lined 331
Stainless steel TL389
Wood-lined R390
Piping
Prefabricated 123
Stainless & high alloy steel 79
Pots
Stainless steel RR382b
Power distribution equipment 50-51
Power transmission equipment
Industrial expansion bulletin GEA-5600 ..... 35-38c
Load-center unit substations, bulletin GEA-3592 ..... 35-38b
Switchgear, metal-clad, bulletin GEA-5664 ..... 35-38a
Process equipment, haveg 308
Pumcups for air or hydraulic pumps, bulletin 4502 ..... 285b
Pumcups for reciprocating pumps, bulletin 4401 ..... 285a
Pumps
Acid, bulletin E-7000 337
Centrifugal
Close-cupld, bulletin 710.1 ..... 316b
Process 101, 297
Self-priming 245
Series 1522 69
Supporthead, bulletin 716.1 ..... 316a
Chemical apportioning TL396
Chemical metering, automatic 416
Cycling jet, bulletin 5030 ..... 344c
General line R379
High vacuum 351a
Process 229
Process, bulletin 08B6815 48
Rotary, folder 526C TL391

Page

Self-priming, corrosion-resistant 267a
Screw, external gear & bearing bracket BL390
Slurry, type R 232
Vacuum 259b
Vacuum, bulletin V51-A 223
Vertical type, mixed acids handling bulletin V-837 ..... T298
Reaction vessels
Shaking type 243a
Stirring type 244b
Refractories
Kiln 108-109
Zirconia, fused stabilized form 1409 362
Rupture discs 52
Rust preventatives, stanorust 302c
Safety equipment
Glass lenses 195
Respirators, AOR 8061 12
Scales
Drum 107
Tank & hopper R392
Separators No. 5000 ..... T284
Shakers, sieve, testing R381
Shovels, power B284
Spray nozzles TR376, R388, BL391
Speed control, variable speed transmission bulletin CE68-a-G 231
Speed reducer drive unit replacements for kilns 66b
Speed reducers
Bulletin 449 330
Worm gear, catalog WR-51 54
Steam traps
Catalog 751 187
Thermostatic, balanced 132
Strainers
Basket type 326
Fine screen, bulletin S-203 ..... B278
Tank cars 181
Tank heating equipment, plate coil 280
Tanks
Horton, stainless-clad steel 30
Stainless steel,
Jacketed, insulated TR387a
Jacketed, open top TR387b
Tire section replacements 66c
Tools, maintenance, wrench equipment & mechanic-type, catalog 194
Towers
Cooling 243
Impervious graphite 265, 309b
Tube cleaners L376

Page

Tubes
Condenser, copper base alloy 192, 374
Steel 92
Tubing
Flexible metal 361
Flexible, seamless 80b
Maintenance information, bulletin TR-516 32-33
Stainless steel, heat exchanger 124
Turbines, steam, type H 126
Unions, connectors, bulletin type 341
Valves
Angle, steel 67c
Back pressure, bulletin 956 ..... 6c
Bronze, screwed or flanged end 39c
Check, steel 67d
Control
Air operated, domotor 114a
Bulletin 8210 ..... T256
Diaphragm 6, 266
Manually-operated, handwheel 114c
Spring-diaphragm, bulletin 700-3 219
Corrosion-resistant 267b
Diaphragm, L-1 plactic diaphragm R413
Gate
Alloy cast iron, No. 14477 183
Cast steels 295
Clamp, iron 215
Corrosion-resisting 34
Forged steel 273
Stainless steel 354c
Steel 67a
Gear operated, hypreseal 39e
General line for use in oil research center 279
Globe
Corrosion-resisting, Bel-o-seal 354d
Flanged end 354f
Stainless steel 354a
Steel 67b
Hastelloy B, acid chloride handling 39g
Heavy duty
Cast iron, No. 700 ..... 372b
Cylinder operated No. 627 ..... 372c
Motor operated, No. 797 ..... 372a
Iron, bulletin 805 89
Lift-plug, non-lubricated 82
Liquid level, flanged end 354e
Monel, food industry applications 39b
Multiport, three-way 39d

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

3	22	45	66c	90b	109e	116	128–129m	187	214	243	267b	283	299	316a	336	346	374	L383	TL391
4a	23	47	66d	91	101	117	128–129n	189	215	244	268a	T284	T300	319b	341	347	375	R383	BL391
4b	24–25	48	66e	92	102	118	130–131	191	216	245	268b	B284	B300	317	343	356	L376	L384	L392
5	26–27	49	66f	93	103	119	132	193	219	246	268c	268a	301	318	344	350	TR376	R384	R302
6	28–29	50–51	67a	94	104a	120–121	133	194	221	247	269	285b	302a	321	345–346	361	BL376	L385	L393
7	30	52	67b	95	104b	122	134–135	196	223	248a	T270	286	302b	323	347	362	R377	R385	L394
8a	31	53	67c	96	107	123	136a	196	224	248b	B270	287	302c	324	348a	363	378a	L386	R394
8b	32–33	54	67d	97	108–109	124	136b	197a	225	251	271	288	303	325	348b	364a	378b	R386	395
8c	34	55	68	98	111	125	136c	197b	226	252–253	T272	T289	305	326	349	364b	TL379	L387	TL396
8d	34–35a	56	69	99	113a	126	136d	197c	227	255	B272	B289	306a	327	350	364c	BL379	TR387a	TR396
9	35–35b	57	70	99a	113b	127	136e	197d	229	T266	273	290	306b	328	351a	364d	R379	TR387b	409
10	35–36c	58	71–72a	99b	113c	128–129a	136f	197e	231	B266	T274	291	306c	329	351b	365a	L380	BR387	L410a
11	36a	59	71–72b	91	113d	128–129b	136g	197f	232	257	B274	292–293a	307	330	351c	365b	TR380	TL388	L410b
12	36b	61	71–72c	92	113e	128–129c	136	197g	233a	258	275	292–293b	308	331	351d	366	BR380	BL388	R411
13	36c	62	71–72d	93	113f	128–129d	177	201	233b	259a	276	292–293c	309a	332	353	367	TL381	R388	L412
14a	36d	63	73	94	113g	128–129e	181	202	233c	259b	277a	292–293d	309b	T334	353	368	BL381	TL389	R413
14b	36e	64	74	95	113h	128–129f	183	203	234	259c	277b	292–293e	310a	B334	354a	369	R381	BL389a	414
15	36f	65a	75	96	114a	128–129g	185a	204	235	260	277c	295	310b	335a	354b	370	L382a	BL389b	T415
16	36g	65b	76	97	114b	128–129h	185b	205	236	261	277d	T296	312	335b	354c	371	L382b	R389	416
17	40	65c	77	98	114c	128–129i	185c	206	237	262	T278	B296	313	335c	354d	372a	TR382	TL390	L417
18–19	41	65d	78	99	113a	128–129j	185d	207	239	263	B278	297	314	335d	354e	372b	BR382a	BL390	419
20	42–43	66a	79	100a	115b	128–129k	185e	208	240	265	279	T298	315a	335e	354f	372c	BR382b	R390	430
21	44	66b	80a	100b	115c	128–129l	185f	209	241	267a	280	B298	315b	337	355	373			

Editorial Items

178A	180D	182F	182M	186C	186J	188G	191A	192B	192I	194E	198A	202A	206D	206J	207C	207I	207P	208E	208K
178B	180E	182G	182N	186D	188A	188H	191B	192C	193J	194F	198A	202B	206E	206K	207D	207J	207Q	208F	208L
179A	182A	182H	184A	186E	188B	188I	191C	192D	194A	195A	199B	204A	206F	206L	207E	207K	208A	208G	208M
179B	182B	182I	184B	186F	188C	188J	191D	192E	194B	195B	199C	206A	206G	206M	207F	207L	208B	208H	208N
180A	182C	182J	184C	186G	188D	190A	191E	192F	194C	198A	206A	206B	206H	207A	207G	207M	208C	208I	208P
180B	182D	182K	186A	186H	188E	190B	191F	192G	194D	198B	206B	206C	206I	207B	207H	207N	208D	208J	208Q
180C	182E	182L	186B	186I	188F	190C	192A	192H											

Card Expires April 15

	Page
Ni-resist, plastic & food industry applications	39f
Packless, bulletin AC-813	235
Plug	
Cylindrical, lubricated	31
Lever-sealed, bulletin 39-3	41
Lubricated	287
Pressure-seal, circular 116	35
Pressure reducing	
Single seat, bulletin 950	5b
Streamlined, bulletin 962	6a
Self-contained, bulletin 966	8d
Solenoid	114b
Solenoid, direct acting, bulletin V	BL281
Stainless steel, No. 316	39a
Swing check, stainless steel	354b
Vacuum	351c
V-port	274

	Page
Water cooling equipment, grid type fill	325
Water treatment	
Aerotor-clarifier	197d
Consulting engineering	197f
Deaerator, vacuum	229
De-Ionization systems	197c
Demineralizers, ion-exchange	310b
Filters, trickling	197b
Fluosolids system	197a
Industrial water purification	197g
Ion exchangers	98
Ion exchange, bulletin 4681	196
Ozone treatment	350
Sludge contact reactor	244
Vacuators	197e
Well water supply unit	207
Wire mesh	T300

ADVERTISING STAFF

SALES MANAGER.....Bayard E. Sawyer
BUSINESS MANAGER.....Albert E. Weis

Sales Representatives:

ATLANTA.....R. C. Maultsby
BOSTON.....W. D. Boyd
CHICAGO.....L. A. Cunningham
CHICAGO.....J. M. Rodgers, Jr.
CLEVELAND.....D. G. Sawyer
DALLAS.....J. H. Cash
LOS ANGELES.....J. H. Allen
NEW YORK.....R. G. Frederick
NEW YORK.....J. E. Tuohig
PHILADELPHIA.....E. M. Schellenger
PITTSBURGH.....D. A. Facka
SAN FRANCISCO.....Ralph Dorland

NOW AVAILABLE

Reprints of last month's Chemical Engineering Report

CATALYSTS

HOW to choose a catalyst. The four requirements a catalyst must meet. Developing a catalyst: varying components, varying process conditions.

HOW catalysts are made. Various shapes suit various process conditions. Supports, deposition, pellets, spheres, powders, rings, granules, beads and microspheroids.

HOW all major branches of industrial chemistry have been touched by catalysts. Synthetic detergents, resins, synthetic fibers, synthetic rubber, aromatics, aviation gas.

12 PAGES on selection, manufacture and applications of catalysts. We don't know much about how they work, but what they are doing is important. Find out.

ASK FOR: Reprint C. Price 25¢. Send orders with remittance to:

Chemical Engineering
Attention: M. Molin
330 West 42nd St.
New York 36, N. Y.

USE THIS HANDY READER SERVICE POST CARD

Name _____

Position _____

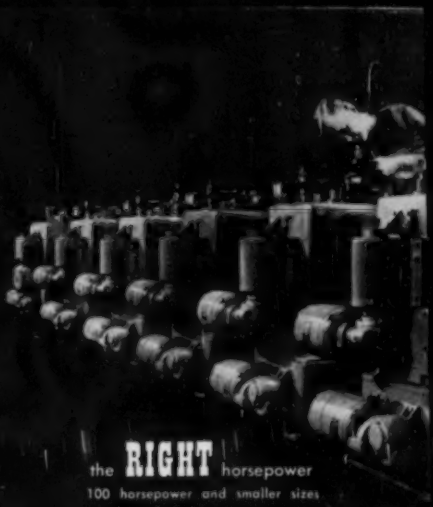
Company _____

Address _____

City & State _____

PLACE 3¢ STAMP HERE

CHEMICAL ENGINEERING
READER SERVICE DEPARTMENT
330 W. 42nd STREET
NEW YORK 36, N. Y.



the **RIGHT** horsepower
100 horsepower and smaller sizes

Every time on every application the power drive that is the best is the one that gives you the RIGHT horsepower, the RIGHT shaft speed and RIGHT where you need it . . . all combined into one compact power package.

Don't put up with makeshift assemblies when it's so easy to get a unit that's just right for each job.

Master Motors, available in thousands and thousands of types and ratings (up to 150 HP), give you an enormous selection of units designed so that they easily combine to give you a power drive that will add greatly to the compactness, safety and economy of each job. Open, enclosed, splash proof, fan cooled, explosion proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single

it works out the same every time

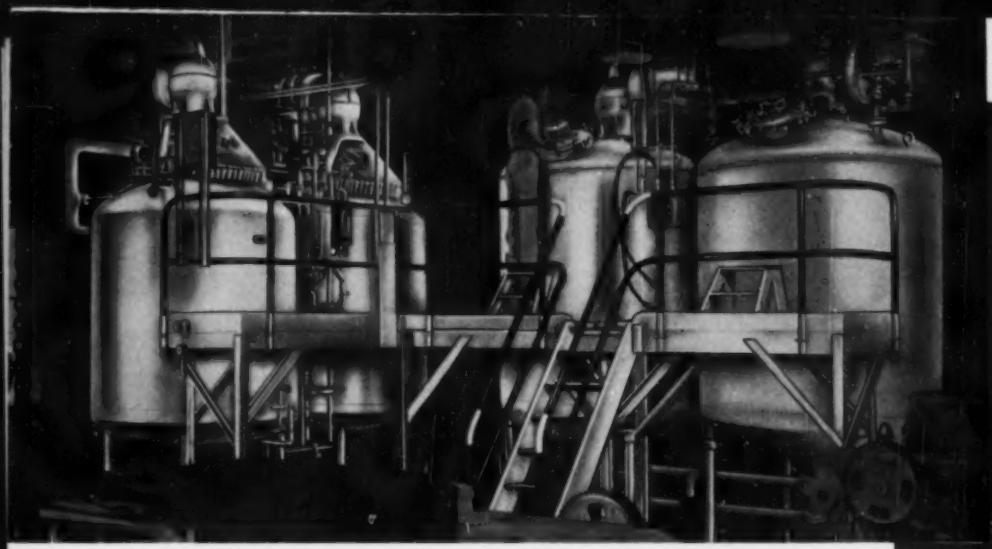
speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 432 to 1 ratio . . . with electric brakes . . . with mechanical variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best motor drive for YOU.

Select the RIGHT power drive from Master's broad line and you can increase the saleability of your motor driven products . . . improve the economy and productivity of your plant equipment.

the **RIGHT** shaft speed
Gear reduction ratios up to 432 to 1

and **RIGHT** where you want it

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO



USERS, who have tested this new glass, find that it is *at least three times more resistant* to alkaline solutions than any Pfaudler glass formerly available.

How new Pfaudler *ALKALI-RESISTING* Glass can *save you time and money* all along the line

COMPARATIVE TESTS show that new Pfaudler alkali-acid-resisting glass (left) withstands buffered NaOH,pH 11.5 at 212° F. for 30 days with no noticeable change, while former high-quality Pfaudler glass (right) is severely etched under the same conditions.

WHY the chemical process industries prefer glass-lined equipment:

1. Pfaudler glass, backed by steel, is *one of the most durable materials of construction.*
2. Resistance to all acids (except hydrofluoric)—now combined with resistance to alkaline action for even greater flexibility and service life.
3. Product purity is improved by elimination of metallic contamination.
4. Ease of cleaning and sterilizing protects product quality, saves time and labor costs.
5. Polymers will not adhere to glass surface.

Pfaudler glass backed by steel—*one of the most durable materials of construction* known to man—is now better, more flexible, and more economical to use than ever before!

ACID-RESISTING, TOO!

The new Pfaudler glass was specially developed to give *longer life* to glass-lined equipment where alkaline reactions are encountered, but *without any reduction whatsoever in its acid-resisting properties.* It promises to solve many chemical processing problems in the pH range from 9 to 12, which, until now, have been unusually severe on glass-lined equipment.

ADDED FLEXIBILITY!

Now, for the first time, the new Pfaudler glass makes it possible for you to go from acid to alkaline solutions in the same vessel. And the easy-cleaning features of Pfaudler glass-lined equipment allow you to make the change in minimum time.

HOW YOU SAVE...

This new flexibility means that you need only one vessel where dissimilar operations formerly required two. What's more, you can standardize on a single type of unit and narrow down on spare parts. You'll need fewer structures and be able to save space, too. And use of the new glass may even eliminate many of your valve, piping, pumping and gasketing problems.

MANY APPLICATIONS!

Many uses are indicated for vessels lined with the new Pfaudler Alkali-Resisting glass. For example, neutralization of acid solutions in the same processing unit; storage of mild alkalies; processing of alkaline reactions within the range of pH 12 and up to 212° F. Are there other uses in *your* processing?

GET ALL THE FACTS! Send the coupon today for full details on this amazing alkali-resisting, acid-resisting glass.

Pfaudler

THE PFAUDLER CO., ROCHESTER 3, N. Y.

ENGINEERS AND FABRICATORS OF CORROSION RESISTANT PROCESS EQUIPMENT

THE PFAUDLER CO., DEPT. CE-1, ROCHESTER 3, N. Y.

Send complete information on the new Pfaudler Alkali-Resisting Glass to:

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____